PESTICIDES ABSTRACTS

July 1975 - Vol. 8, No. 7

Abstracts 75-1495-1798

PSTAB 08(07) 433-499 (1975)

U.S. ENVIRONMENTAL PROTECTION AGENCY

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
TECHNICAL SERVICES DIVISION
Rm. EB-49, 401 M Street, S.W.
Washington, D.C. 20460

PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commercial materials, equipment, or processes mentioned therein.

CONTENTS

Volume 8 July 1975 No. 7

Page

General 433
(News items, letters, and editorials appearing in scientific and technical journals; information on production and use; and other items of general interest)

Monitoring and Residues 440
(Levels of pesticides in people or nonexperimental animals or in water, air, soil, food, feed, and other consumer products)

Epidemiology, Prevention and Treatment 453
(Frequency and distribution of pesticide poisoning in man or nonexperimental animals and treatment of clinical cases; morbidity and mortality; safety measures; decontamination; disposal of containers and wastes; legislation and regulations)

Toxicology and Pharmacology 459
(Toxicity studies in man and animals; effects on cells; organs, and systems; metabolic studies, biochemistry, interactions; antidotes and other treatment; mode of action. Ordinarily, articles dealing with efficacy studies are not included.)

Analysis 488
(Preparation of samples; analytical methods; instrumentation)

75-1495. Wimmer, J. (Inst. Landwirtsch. Pflanzensch. Forstl. Phytopathol., Hochsch. Bodenkultur. Vienna, Austria). **Quecksilber in der Umwelt. [Mercury in the environment.]** *Bodenkultur* 25(3): 272-290; 1974. (98 references) (German)

Background levels of mercury in the environment, possible sources of contamination, and the toxicity and tolerance limits of mercury compounds are discussed and reviewed with reference to current literature. Particular reference is made to the use of mercury containing compounds as seed dressings in agriculture. It is difficult to distinguish mercury contamination from background levels because the natural presence of mercury in the earth's crust is responsible for widespread traces of mercury in the environment. However, the use of mercury compounds in paper, cellulose, acetaldehyde, and chlorine-alkali industries has definitely caused contamination within the aquatic food chains of some areas. The application of highly toxic and stable alkylmercury compounds (especially methylmercurials) as seed dressings has caused the poisoning of several species of seed eating and predatory birds. As a consequence, some countries only permit the use of seed dressings containing the less toxic and unstable methoxyethylmercury.

75-1496. Chapman, B. (Sponsors of Science Inc., 1119 Woban Hill, Madison, WI 53711). **Sponsors of Science Inc. on the safety of 2,4,5-T and dioxin.** *Clin. Toxicol.* 7(4): 413-421; 1974.

The safety and toxicity of 2,4,5-T and DDT are discussed in a letter written to Senator Gaylord Nelson. Both compounds are rated in comparative toxicity tables as among the least hazardous pesticides for human use. The actual amount of the technical (1,000,000 ppm) compound eaten determines the toxicity. Based on the acute oral toxicity expressed in mg/kg, a 125 lb woman would have to eat her body weight equivalent of material containing 380 ppm of 2,4,5-T to receive a lethal dose. Both 2,4,5-T and DDT in technical form are relatively non-toxic on skin contact (3800 mg/kg for 2,4,5-T and 2500 mg/kg for DDT). The toxicity of the dioxins contained in 2,4,5-T has little, if any, influence on the toxicity of the 2,4,5-T. There have been no human deaths and remarkably few human illnesses because of the agricultural or public health uses of either of these chemicals. There are no significant differences between the health of workers in 2,4,5-T or DDT manufacturing plants and the norm for the general population. Many researchers believe it would be completely erroneous to classify the 2,4,5-T currently manufactured as a teratogen. A no-effect level of 50 mg/kg/day of 2,4,5-T containing less than 1 ppm dioxins is proposed as providing ample protection for human embryos.

75-1497. Montagu, A. (Author address not given.) **DDT and other chemical pollution.** ***In:*** ***The endangered environment.*** Mason and Lipscomb, London, England, 1974, p. 173-192.

Excerpts from publications on the environmental hazards of DDT and other chemical pollutants are compiled. Among the topics are: residues of DDT in fish, which range up to 45 ppm; concentration of DDT in Coho salmon in Lake Michigan; insecticides, such as endosulfan, in the Rhine River; use of carbaryl as a substitute for DDT; the banning of the use of DDT; insect resistance to DDT; production and use of herbicides; the use of 2,4,5-T and 2,4-D in Viet Nam; soil damage due to pesticides; hazards of picloram; teratogenic effects of 2,4,5-T; and cadmium poisoning and methyl mercury poisoning. Cadmium-containing fertilizers and pesticides are a major source of the metal. Exposure to Cd has caused degenerative bone disease, death due to high blood pressure and arteriosclerotic heart disease, and pulmonary damage. Substantial amounts of Hg are used in pesticides. Organomercury fungicides have greatly improved germination success in cereal crops. In the United States, waste containing 2000 tons of Hg is discharged into the environment annually.

75-1498. Jacobson, M. (Agric. Environ. Quality Inst., U.S. Dep. Agric., Beltsville, MD 20705). **Introduction. [to symposium on alternative controls]** *Environ. Lett.* 8(1): 1-3; 1975. (10 references)

The use of pesticides in general and of insecticides in particular has become the target of much criticism. Most of the opposition has been aimed at the "hard-core" pesticides, including the chlorinated organic insecticides such as DDT, dieldrin, and aldrin. Proponents of pesticides cite their many benefits in enhancing the quality and quantity of agricultural production and their use in health protection, particularly against insect-borne diseases. The registered use of DDT in the U.S. was cancelled for all but a few select public health applications in 1972 by the EPA. More recently, aldrin and dieldrin manufacture was suspended. The largest problem with the known synthetic insecticides is insect resistance. This problem necessitates alternative methods of controlling insects that are not only effective but also acceptable to the general public. Apporoaches include natural predators, parasites, pathogens, sexual sterilization, pheromones, and insect growth regulators.

75-1499. Van den Bosch, R. (Div. Biol. Control , Univ. California, Berkeley, CA 94720). **Biological control of insects by predators and parasites.** *Environ. Lett.* 8(1): 5-21; 1975. (37 references)

Biological control is simply the regulation of plant and animal numbers by natural enemies. The agents and mechanisms of biological control include predators, parasitoids (insects which parasitize insects), and pathogens (microbial parasites). The most important characteristic of predatory and parasitic insects is their reciprocal density dependence, i.e., their characteristic tendency to increase in numbers when their hosts become numerous, and decrease as the hosts are suppressed. Both classical and naturally-occurring biological controls are discussed. Integrated control is a strategy in which methods, materials, knowledge and information are meshed to accomplish the management of pest populations in the most economically sound and environmentally and sociologi-

cally desirable ways. Under this concept, natural enemies, pesticides, cultural practices, messenger chemicals and resistant host varieties become mutually augmentative instead of individually exclusive or even antagonistic as was often the case in conventional pest control. Ways in which natural enemy populations are augmented are presented. The use of biological control in the future is discussed.

75-1500. Ignoffo, C. M. (Biol. Control Insect. Res., U.S. Dep. Agric., Columbia, MO 65201). **Entomopathogens as insecticides.** *Environ. Lett.* 8(1): 23-40; 1975. (42 references)

Entomopathogens, diseases of insects, are suggested as a possible new generation of safe, selective insecticides. Generally the period required to develop an entomopathogen into a microbial insecticide would be 5 to 7 yr. Production must pass through several stages, including the isolation, characterization, formulation, laboratory production, small efficacy tests, single dose safety tests, large efficacy tests, safety environment, safety multiple dose tests, pilot plant production, safety monitor for production personnel, and the establishment of a production plant. Technology is now available to commercially produce entomopathogens on either living or artificial substrates. Extensive tests have thus far indicated that at least two entomopathogens, *Bacillus thuringiensis* and *Baculovirus heliothis*, are not toxic or pathogenic to man, other animals, or plants. The effectiveness of entomopathogens belonging to each of the major groups has been demonstrated many times, and at least 100 serious arthropod pests have been controlled by the artifical application of entomopathogens. The registration of microbial insecticides is discussed. A list of commercial microbial insecticides is provided.

75-1501. Roelofs, W. (Dep. Entomol., New York State Agric. Exp. Stn., Geneva, NY 14456). **Manipulating sex pheromones for insect suppression.** *Environ. Lett.* 8(1): 41-59; 1975. (74 references)

A review is given of different methods of using sex pheromones in pest control programs. Survey and monitoring traps have been used extensively for determining the presence and abundance of pest populations and are commercially available. Pheromone trapping studies for insect suppression have shown success with some species and could become a useful tool in some situations. The technique of attracting insects to the host for insect removal or exposure to insecticide has also proved to be useful in some programs. Mating disruption studies using widely-separated pheromone evaporators or encapsulated pheromone distributed throughout an area have indicated a great potential for this technique in insect suppression programs. The practical application of any of the proposed techniques by pest managers is dependent on more biological data, efficacy data, refined formulations, chemical registration and availability, and increased financial support of all of these factors.

75-1502. Borkovec, A. B. (Insect Chemosterilant Lab., Agr. Environ. Qual. Inst., AKS, Beltsville, MD 20705). **Control of insects by sexual sterilization.** *Environ. Lett.* 8(1): 61-69; 1975. (21 references)

The most common and satisfactory response to controlling infestations by injurious insects has been through the application of insecticides. However, it is deemed more desirable to lower the birth rate than to increase the death rate of such pests. This can be accomplished by sterilization, either by irradiation with gamma rays or by the application of chemosterilants. The sterilized insect must remain sexually competitive with its normal counterpart. In the use of radiation, the insects must be reared, treated, and then released. Chemically induced sterility, on the other hand, can be used not only for released insects, but also for insects that are members of naturally existing populations. All pesticides, including chemosterilants, are poorly suited for controlling low-density, diffused populations, a situation in which the release of irradiated insects is most effective. For direct sterilization of naturally occurring insects, chemosterilants with toxicological properties similar to those of common insecticides are needed. Unfortunately all present chemosterilants that are highly effective in male insects are also mutagenic, and, although the potential danger to humans may not be excessive in some cases, their use for general broadcasting and dispersal in nature is undesirable and should not be attempted. The almost infinite variety of chemical structures and the concurrent subtle differences in biological activity and distribution in the organism make chemosterilants more flexible and frequently preferable to radiation. Successful treatment of the screwworm is reviewed.

75-1503. Menn, J. J.; Pallos, F. M. (Stauffer Chem. Co., Western Res. Ctr., Mountain View, CA 94042). **Development of morphogenetic agents in insect control.** *Environ. Lett.* 8(1): 71-88; 1975. (51 references)

Chemicals which interfere with the growth and development of insects, morphogenetic agents, have received attention as potential means of selective insect control. Major advances resulted from the identification of Juvenile Hormones (JH) -1, -2, and -3, and the discovery that various terpenoid and sesquiterpenoid derivatives were more potent morphogenetic agents than the 3 known Juvenile Hormones. Early research in this field is reviewed. The discovery of the terpenoid nature of JH-1 and -2, led to an intensive synthesis effort and several thousand morphogenetic compounds have been made. Various field trials are reviewed, including those conducted with RO-20-3600, 6,7 - epoxy - 3,7 - dimethyl - 1 - [3,4 - (methylenedioxy) - p - phenoxy] - 2 - nonene; R-20458, 1 - (4′ - ethyl phenoxy) - 6,7 - epoxy - 3,7 - dimethyl - 2 - octene; Altosid, isopropyl (2E,4E) - 11 - methoxy - 3,7,11 - trimethyl - 2,4 - dodecadienoate; Altozar, ethyl(2E,4E) - 3,7,11 - trimethyl - 2,4 - dodecadienoate; ZR - 777, isopropyl(2E,4E) - 11 - methoxy - 3,7,11 - trimethyl - 2,4 - dodecadienoate; and PH 60 - 40, 1(4 - chlorophenyl) - 3 - (2,6 - difluorobenzoyl) - urea.

75-1504. Aebi, H. (Univ. Berne, Switzerland). **Man in the technological age and his environment.** ***In:*** *Environmental Quality and Safety, Vol. 2,* F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 1-14. (36 references)

The environmental effects of pesticides are reviewed with emphasis on DDT. The presence of pesticides in concentrations as low as 1 ppb by weight can be determined. The main problem associated with DDT is its lack of specificity; it remains biologically active over practically unlimited periods. Repeated applications lead to accumulation, mainly due to its high fat solubility, which greatly favors persistence in the fatty phase of vegetable and animal organisms. In the adipose tissue of humans amounts of 2-10 mg/kg have been detected. The most severely affected animals are birds of prey which suffer disturbances in their calcium metabolism. The use of DDT is either restricted or completely banned in the highly industrialized nations. Developing countries are indifferent to slight residues in adipose tissue because of the need to produce adequate food supplies. DDT has helped to eradicate malaria in large numbers of countries.

75-1505. Murphy, W. B. (Campbell Soup Co., Camden, NJ). **Some of the opportunities for science in the food industry.** ***In:*** *Environmental Quality and Safety, Vol. 2,* F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 14-21.

Opportunities for science in the food industry are discussed, including developments in pesticides. Predator controls should be developed by means that are supplemental to chemicals. The development of disease-resistant and predator-resistant varieties and biological controls are possibilities. In the United States, crop losses due to insects, plant diseases, nematodes, and weeds are equal to about 1/3 of the gross farm income. These losses are far greater in less developed countries. Highly efficient and non-persistent chemical pesticides are needed. Chemicals are now the most effective tools for many agricultural problems. Chemicals must be applied with skill and with restraint. Overdosage should be avoided, and the importance of the waiting period after control treatments should be kept in mind.

75-1506. Turtle, E. E. (Plant Prod. Protect. Div., FAO, Rome, Italy). **Some FAO activities and attitudes concerning pesticides.** ***In:*** *Environmental Quality and Safety, Vol. 2,* F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 21-24.

The activities of the FAO in the plant protection field are summarized. The FAO Pesticide Program commenced in 1959 and is largely directed to the encouragement of higher standards of scientific and technical supervision for pesticide introduction and use. Groups of experts were organized to advise on specific aspects including: control of pesticides; residues of pesticides in food; the increasing occurrence of strains of pests that are resistant to the pesticides formerly used; and methods of pest control. FAO is responsible for projects designed to improve competence in the control of pests in many countries. These projects normally are broad in conception, containing major inputs in entomology, plant pathology, and similar biological subjects. Some include assistance in setting up procedures for regulating the introduction of new products. Others are concerned with the ability to measure pesticides residues in foods and other environmental materials such as soil and water.

75-1507. Klein, W. (Institut fuer oekologische Chemie der GSF, St. Augustin 1, Germany). **Research in the Gesellschaft fuer Strahlen- und Umweltforschung on the evaluation of the risks involved in environmental chemicals.** ***In:*** *Environmental Quality and Safety, Vol. 2,* F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 244-247.

Research projects in the Gesellschaft fuer Strahlen- and Umweltforschung on the evaluation of the risks involved in environmental chemicals are described with emphasis on the work of the Institute for Environmental Chemistry. The Institute is concerned with the fate of potentially hazardous environmental chemicals under biotic and abiotic conditions. Model compounds for investigations into the fate of environmental chemicals include DDT, polychlorinated biphenyls, lindane, cyclodiene insecticides, and other chlorinated aromatic chemicals. The investigations aimed to identify the significant conversion products in the environment for their toxicological evaluation, and to perform balance studies which will give information on the long-term impact of these compounds on the environment. Results are described using the example of aldrin and the fate of aldrin-^{14}C in maize after soil application under practical conditions.

75-1508. Salzer, W. (Farbenfabriken Bayer, 56 Wuppertal-Eberfeld, Germany). **Economic importance of chemical crop protection in relation to its ecological impact.** ***In:*** *Environmental Quality and Safety, Vol. 2,* F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 271-280. (11 references)

The economic importance of chemical crop protection is discussed in relation to its ecological impact. Insect pests account for 14% of the loss of potential world crop production, plant diseases for 12%, and weeds for approximately 9%. The loss of the potential world rice production from insect pests, diseases, and weeds is currently estimated at 46% as opposed to only 24% for wheat. This means that the annual quantitative loss of rice amounts to 200 million tons. After 1953, rice growers in Japan made systematic and successful use of insecticides and fungicides, followed later by herbicides, which led to outstanding increases in production. Japan changed from a rice-importing country to one with surplus rice production. Potato production gains in the United States from 1945-1950 were a direct result of using DDT for the control of potato leafhopper and Nabam for the control of late blight. The costs of crop protection include not only the cost of the chemicals, but damage to game, fish, and water, and the costs of protecting the public and informing the

farmer. These costs must be balanced against profits from increased crop yields.

75-1509. Mollenhauer, H. P. (Ministerialrat, D 53, Bonn - Bad Godesberg, Germany). **Environment program of the Federal Republic of Germany.** ***In:*** *Environmental Quality and Satety, Vol. 2,* F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 296-297.

The environment program of the Federal Republic of Germany which relates to the occurrence of chemicals in the environment is discussed. The study of the chemical contamination of the environment is based upon the knowledge gained in the control of pesticides. Intentionally or unintentionally pesticide residues can enter the food chain. Effective regulations on the use of pesticides in agriculture exist concerning their sale and application as well as residues in foods. Further development of and support for methods of biological plant protection in conjunction with an unavoidable measure of pesticides are required. The use of pesticides must be kept in a sensible proportion to the economical damage which is to be prevented; pesticides should only be applied when really necessary.

75-1510. Anonymous. **Pollution control in Eàgland.** ***In:*** *Environmental Quality and Safety, Vol. 2,* F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 302-305.

Regulations and procedures for the control of pollution in England by substances, inciuding pesticides are summarized. The Ministry of Agriculture, Fisheries, and Food (MAFF) is responsible for the control of agricultural chemicals including pesticides and for checking that food is not contaminated. The MAFF Infestation Control Laboratory and Monks Wood Laboratory are both concerned with pesticides and toxic chemicals. The sale and use of pesticides is regulated by a voluntary control scheme. Under this scheme a large number of the uses of the most persistent pesticides have been phased out and residues of pesticides in wildlife are declining. Bird populations are recovering. Under this scheme DDT was no longer supplied for use in homes and gardens after Sept. 1971.

75-1511. Lu, F. C. (Food Additive Unit, WHO, Geneva, Switzerland). **WHO's food safety programs and the problem of mercury as a food contaminant.** ***In:*** *Environmental Quality and Safety, Vol. 2,* F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 309-319. (29 references)

The activities of the World Health Organization in the field of food safety are outlined. These include the convening of Expert Committees on Food Additives and Pesticide Residues, the support of the Joint FAO/WHO Food Standards Program, and the solicitation of information needed for evaluation of food additives, contaminants, and pesticide residues. The Codex Committee on Pesticide Residues recommends, on a world wide basis, tolerances for particular pesticides in specific foods. The Expert Committees on Food Additives and Pesticide Residues have, where appropriate, allocated acceptable daily intakes (ADI) for man. The ADI of a chemical is defined as the daily intake which, during an entire lifetime, appears to be without appreciable risk on the basis of all known facts at the time of evaluation. It is expressed in milligrams of the chemical per kg of body weight. The problem of mercury as a food contaminant and the way in which it is dealt with at an international level are briefly discussed.

75-1512. Chegrinets, G. Y. (A. N. Marzeyev Res. Inst. General and Communal Hyg., Kiev, USSR). **Po povodu stat'i N. N. Krasyuk, V. N. Zhulenko and R. V. Stavitskiy "K voprosu o migratsii rtuti, soderzhashcheysya v nekotorykh pestitsidakh, v biologicheskikh tsepyakh." [Migration of mercury contained in some pesticides in biological chains. Comments.]** *Gig. Sanit.* 39(5): 93-94; 1974. (11 references) (Russian)

General problems of environmental contamination by mercury, emitted by industries or present in certain pesticides, are discussed in reply to abstract No. 73-1045. Mercury accumulation in cattle is due mainly to dressed seed. Seed dressing sheds should be relocated beyond the limits of residential areas due to serious soil and water contamination hazards. Organomercurial pesticides should be replaced by less toxic compounds. However, such measures would not result in any major reduction of environmental contamination, because of the discharge of large and increasing amounts of mercury by different industries. Mercury present in water is absorbed by algae, plankton, and then by fish. Mercury can also be absorbed in benthic sediments, and be gradually transformed into soluble compounds by microorganisms over a period of several decades.

75-1513. Berkovitch, I. (Tropical Products Institute, London, England). **Pest control research geared to tropical crop conditions.** *Int. Pest Contr.*, 17(1): 17-18; 1975.

Growth and storage of crops in tropical areas presents many specialized problems which are the concern of the Tropical Products Institute (TPI). For 2 major pests, the red bollworm moth, *Diparopsis castanea,* attacking cotton in southeastern Africa, and the Egyptian cotton leaf worm *Spodoptera littoralis,* the sex pheromones have been fully characterized and synthesized, and are highly attractive in the field. A molluscicide has been prepared from endod berries which is non-toxic to humans in use, is readily extracted from the berries, and is toxic to the water-snails which transmit bilharzia, to the mud-snail *Lymnea truncatula,* which transmits liver fluke, and the aquatic leech *Lymnoti nilotica.* Little environmental damage is expected, as this molluscicide is easily broken down by natural processes. Analyzing samples of plant crops, fish and other products from developing countries from pesticide residues is another important function of the TPI. The first laboratory for pesticide analysis, situated in Trinidad and serving the Carribean Commonwealth countries, is in operation. Additional such labs are planned. Through

a study of farm losses, TPI concluded that usage patterns minimized the effects of losses and recommended that farmers sell their surplus maize immediately after harvest and retain only sufficient for their own needs. TPI has also defined more precisely the factors which affect the susceptibility of maize.

75-1514. Ghouri, A. S. K. (Agric. Dept., Government Punjab Sargodha, Pakistan). **Selection of safer pesticides for the protection of cotton crop in Pakistan.** *Int. Pest Contr.* 17(1): 18; 1975.

In Pakistan there has been in the past a lack of effort regarding systematic studies on the biology, physiology, and ecology of cotton pests. The lack of integrated control has made it essential to use pesticides for the protection of the economically important cotton crop. The manner of choosing the right pesticide to use and the proper handling and use of chemicals have not been understood. Thus, large numbers of pesticides with high mammalian toxicity, which are potentially very dangerous, have been procured and distributed to farmers. Fatal accidents have heightened the need for a critical review of the pesticide situation. Nationalization is recommended as the first step needed for a significant reduction in the long list of pesticides. Not only must the technical aspects governing mammalian toxicity, selectivity, and specificity be understood, but the financial aspects must also be examined. Availability of a pesticide locally rather than requiring importation of the chemical is an important factor.

75-1515. Nilsson, C. A.; Andersson, K.; Rappe, C.; Westermark, S. O. (Dep. Organic Chemistry, Univ. Umea, Umea, Sweden). **Chromatographic evidence for the formation of chlorodioxins from chloro-2-phenoxyphenols.** *J. Chromotogr.* 96(1): 137-147; 1974. (13 references)

The photochemical and thermochemical decompositions of a trichloro- and a pentachloro-2-phenoxyphenol have been studied. The photolysis of the pentachloro-2-phenoxyphenol, which is one of the impurities found in commercial 2,4,6-trichlorophenol, gave 1,2,3,8-tetrachlorodioxin, two trichlorodioxins, a dichlorodioxin and a dichlorodibenzofuran. The pyrolysis of the phenoxyphenols yielded a dichloro- and a tetrachlorodioxin, respectively, as the only detectable products. Consequently, we believe that the level of chloro-2-phenoxyphenols in commercial chlorophenol formulations should be minimized. (Author abstract by permission)

75-1516. Jernelov, A.; Landner, L.; Larsson, T. (Dep. Biol., Swedish Water and Air Pollution Res. Lab., Stockholm, Sweden). **Swedish perspectives on mercury pollution.** *J. Water Pollut. Control Fed.* 47(4): 810-822; 1975. (52 references)

This paper contains a brief historical review of the research on mercury in the aquatic environment and provides an outline on the present state of the art as seen from the Swedish viewpoint. Included are: the biological methylation of mercury along with kinetic studies; static and dynamic aspects of the accumulation of mercury in the food chains; the restoration of mercury-contaminated bodies of water; the atmospheric transport of mercury; the chemical species and concentration of methylmercury in water; and the biological degradation of methylmercury.

75-1517. Misato, T. (Author address not given). [**New approaches to development of safe pesticides.**] *Kagaku Kogyo (Chem. Ind. Tokyo)* 25(12): 1339; 1974. (Japanese)

The required features for future pesticides are a specific effect against a specific pest and rapid degradation of pesticides under normal conditions, under UV light, or by microorganisms, so that they will not accumulate in biological systems over the long run or exert any harmful effect on other biological functions. Optimally, the degradation products of pesticides should be naturally occurring environmental compounds or elements which can thus be absorbed by the environment. In this sense, safe pesticides in the future would have chemical structures the same as or similar to those of natural compounds and be water-soluble compounds. Some natural compounds showing an inhibitory effect on crop diseases are lecithin, ferrous acid, tartaric acid, nicotinamide, sodium polyphosphate, and sugar esters. Lecithin, for example, can be isolated from egg yolk, and it is more inexpensively available as the byproduct of soybean oil production from soybeans. It has both hydrophilic and oleophilic groups, and degrades into amino acids and fatty acids. Lecithin is used as a food additive for some foods and its toxicity to living organisms is quite small. The permissible intake level of lecithin by humans, the ADI value, is 50-100 mg/kg. Lecithin is known to prevent powdery mildew and downy mildew in plants.

75-1518. Goetz, P. (Fac. Pediatrics, Prague, Czechoslovakia). **Symposium on the mutagenicity testing of environmental contaminants.** *Mutat. Res.* 31(2): 129-130; 1974.

The program of the International Symposium on Testing Mutagenic Effects of Environmental Contaminants is summarized. The topics included: effects of chemical mutagens on the population; molecular mutagenesis; toxicological considerations on mutagenicity testing; origin of chromsome aberrations; dominant lethal test; gene mutations in mammalian cells in vitro; mutation in somatic cells; cytogenetic results in man; cytogenetic examination of germ cells; monitoring the human population; advantages of host-mediated assay with mammalian cells; assessment of host-mediated assay with microorganisms; plant methods and evalulation of results in mutagenicity testing; and *Drosophila melanogaster* methods. Three tests were recommended for use: a host-mediated microbial assay; determination of chromosomal aberrations in mouse bone marrow; and the dominant lethal test in mice.

75-1519. Bedford, C. T. (Shell Research Ltd., Tunstall Lab. Sittingbourne, Kent, England). **Von Baeyer/IUPAC**

names and abbreviated chemical names of metabolites and artifacts of aldrin (HHDN), dieldrin (HEOD) and endrin. *Pestic. Sci.* 5(4): 473-489; 1974. (14 references)

The correct von Baeyer/IUPAC names of aldrin (HHDN), dieldrin (HEOD), and endrin, of 5 previously incorrectly-named compounds, and of 18 other related compounds which have not hitherto been named in this way are presented in tabular form alongside their structural formulas. The von Baeyer ring systems present in some of these compounds were identified by inspection of Schlegel diagrams (planar representation of bridged hydrocarbons), a guide to the construction of which is presented. Also included in the tables (which have been indexed) are abbreviated chemical names; the suitability of the choices made is discussed. The alternative "polyhydroaromatic" names for 12 of these compounds have been abstracted from the literature and listed. (Author abstract by permission)

75-1520. Singh, B.; Bhushan, D.; Adlakha, R. C. (Council Sci. Ind. Res., Rafi Marg, New Delhi, India.) **Pesticides—research & development in the CSIR.** *Pesticides* 9(1): 23-39; 1975.

The Indian Pesticide industry currently leans heavily on foreign technology for the range of pesticide products now on the Indian market. With India's limited resources, the industry's efforts are directed primarily toward research and development for the production of selected groups of known pesticides. Long range efforts will simultaneously be directed toward the development of new pesticides suited for Indian conditions and toward work on biological methods of pest control. This work is being carried out by the Council of Scientific & Industrial Research (CSIR), agricultural research institutions, universities, and private industrial firms. The type of work being carried out at the CSIR Laboratories and Institutes is briefly described, and the status of commercialization and technologies released to industry is appended.

75-1521. Wood, D. L. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Aldrin and dieldrin.** *Science* 186(4160): 196; 1974.

The continued use of aldrin and dieldrin despite their suspension by the Environmental Protection Agency is reported in a Letter-to-the-Editor. The use of these compounds will be permitted against termites, as a dip for roots and tops of nonfood plants, and against clothes moths under certain circumstances.

75-1522. Gillette, R. **Cancer and the environment (II): groping for new remedies.** *Science* 186(4160): 242-245; 1974.

Factors which aid in deciding whether a particular product should be banned are discussed. The ban on dieldrin and aldrin was relatively easy to achieve because substitutes were available. However, a product such as vinyl chloride poses a much more difficult problem. This substance has been employed in a myriad of fields. Use as a propellant in cans of aerosol pesticides has now been banned, but apparently no thought is being given to an absolute ban on vinyl chloride emissions, which the plastics industry says would cost the nation $90 billion in industrial output and entail a loss of 2.2 million jobs. At a meeting organized by the National Institute of Environmental Health Sciences some thoughts were presented on this subject. Chronic exposure to carcinogens in the environment must be assumed to pose some risk to a large population. Some carcinogens can and should be avoided. Others may be limited in their release to the environment and, if necessary, their production and use. Despite the difficulties of extrapolating from animal tests to man, regulatory agencies should use such tests in setting an "acceptable risk of exposure." The current state of legislation for The Toxic Substances Control Act is reviewed.

75-1523. Djerassi, C.; Shih-Coleman, C.; Diekman, J. (Stanford Univ., Stanford, CA 94305). **Insect control of the future: operational and policy aspects.** *Science* 186(4164): 596-607; 1974. (47 references)

Operational and policy aspects of insect control for the future are discussed. Human and insect population control have several features in common, all of them indicating that the lag times in converting laboratory discoveries into practical agents are increasing greatly. Return-on-investment (ROI) calculations are significant in decisions related to the development of new agents. The ROI calculations are particularly important in the field of insect control because by being more specific the agents of the future are likely to cover smaller markets. Recommendations for stimulating the development of new methods of insect control are proposed: preparation of research impact statements; new funding mechanisms for long-term toxicology studies; expediting the experimental permit phase; modification of regulations for patent protection; and paying bonuses to encourage the use of environmentally desirable agents.

75-1524. Koehler, C. S. (Dept. Entomol. Sci., Univ. California, Berkeley, CA 94720). **Insecticides for the future: needs and prospects.** *Science* 186(4164): 654, 656; 1974.

Topics of papers presented at a conference on insecticides for the future are reported. Current trends indicate that the organophosphorus insecticides will continue to be major pest control agents in the immediate future. A great need remains for such compounds with more selective properties, both between species of insects and between insects and mammals. Long range planning to overcome insect control problems must include the development of strategies based on exploiting those aspects of insect biochemistry and behavior for which there exists no counterpart in vertebrates. Screening tests are used in the search for new natural insecticidal products from plants, microorganisms, insects, annelids, and other organisms. Most natural insecticidal products are complex structures, and the toxic moiety is not defined. Simple analogs

maximizing the critical portion of the molecule may provide improved activity, especially with structure optimization to obtain suitable polarity and physicochemical properties.

75-1525. Delvaux, E. L.; Verstraete, J.; Hautfenne, A. (Univ. Cathol. Louvain, Louvain, Belgium). **Les polychloro dibenzo-*p*-dioxines. [Polychlorodibenzo-*p*-dioxins.]** *Toxicology* 3(2): 187-206; 1975. (93 references) (French)

A review of the synthesis and chemical-toxicological properties of chlorodioxins is presented. Polychlorodibenzo-*p*-dioxins (chlorodioxins) are produced when chlorophenols are heated in alkaline solution, especially during the manufacture of other organic derivatives. As a consequence, chlorodioxins may contaminate several industrial chemical products widely used, for instance, as pesticides. They are also occasionally synthesized from chlorophenols or their derivatives in situ during industrial processes. It has been determined that dioxins are the cause of chloracne and chick edema which killed thousands of broiler chickens in the U.S.A., and they are suspected of being fetotoxic even for man.

75-1526. Weil, D. (Author address not given). **Die Kontamination des Menschen und seines Lebensbereiches durch persistente Pestizide und Organohalogen Verbindungen. [Contamination of man and his environment by persistent pesticides and organohalogen compounds.]** *Wasser- Abwasser-Forsch.* 7(6): 179-184; 1974. (5 references) (German)

Studies conducted by the Commission of the European Communities on the persistence, occurrence, analysis, and biological and health hazards of organohalogen pesticides are reviewed. Organochlorine pesticides are present in air, water, soil, and plants, as well as in animal and human bodies. Atmospheric dusts are found to contain 0.1 to 1 ng of lindane, dieldrin, and DDT per kg. Surface waters contain about 100 times higher residue levels, while fish may contain over 100 mg/kg. Due to their physical and chemical resistance and low water solubility, organohalogen pesticides accumulate over trophic chains, reaching cumulation factors of 1,000-1,300 in predatory fish and 3,000 to 75,000 in ichthyophagous birds. The biological hazards of pesticides should be evaluated in animal tests with sensitive species so that the findings can be extrapolated to humans. Currently available epidemiological evidence is not sufficient to suggest a carcinogenic effect of organohalogen pesticides. Such pesticides as DDT should be restricted in view of their hazards and benefits.

75-1527. Harvey, W. A. (Div. Environ. Studies, Univ. California, Davis, CA). **Today's challenges in weed science.** *Weed Sci.* 22(5): 437-439; 1974.

The relationships of weed science to population, affluence, technology, foodproduction, and value systems are discussed. The major challenge in developing countries is to provide adequate food for existing populations and to determine whether increased efficiency of weed control methods will provide more food. There is a direct relationship between affluence and food supply. Technological improvements can lead to more efficient application techniques and equipment, minimizing environmental contamination, and to chemicals that affect weed seed dormancy. Technology has enabled pesticides use to be reduced from 1120 kg of sodium chlorate or 3600 kg of carbon disulfide to 0.56 kg of 2,4-D. Because 95% of the US urban population has little or no understanding of food production, the role of weed science in reducing food costs and in supplying sufficient food is not well known. Weed science can provide knowledge for increasing the efficiency of resource use.

75-1528. Floru, S.; Polizu, A. (Inst. Cercet. Prot. Plant., Bucharest, Romania). **Reziduuri de pesticide organoclorurate in furaje. [Organochlorine pesticide residues in foodstuffs.]** *An. Inst. Cercet. Prot. Plant. Acad. Stiinte Agric. Silvice* 9: 581-586; 1973. (5 references) (Romanian)

Results are presented on studies carried out from 1970 to 1971 on the residue levels of foodstuffs sampled in four districts of Romania. The highest amounts of BHC, DDE, DDT, aldrin, dieldrin, and heptachlor were found in pelleted feeds, lucerne hay, and leguminosae stems, and generally in foodstuffs from the District of Constanta (14 ppm in lucerne). The lowest residue values were determined in fodder rye and vetch. Total organochlorine contents ranged from 0.2-18.4 ppm. BHC generally exceeded DDT levels by at least 2-fold.

75-1529. Polizu, A.; Serban, V. (Inst. Cercet. Prot. Plant., Bucharest, Romania). **Cercetari asupra dinamicii reziduurilor de metilclor si DDT pe fructe si legume. [Studies on the dynamics of methylchlor and DDT residues in fruits and vegetables.]** *An. Inst. Cercet. Prot. Plant. Acad. Stiinte Agric. Silvice* 10: 473-478; 1974. (5 references) (Romanian)

Between 1971 and 1972 investigations were conducted on pesticide residues on apple and pear trees, tomato and sweet pepper plants in the field, and on eggplants in the greenhouse. The residues in fruits were determined by gas chromatography. In all cases, the initial values for methylchlor were greater than those for DDT, but 5 days after spraying, the methylchlor residues declined below those of DDT, with the breakdown curve for methylchlor remaining below that for DDT. Estimation of the percent loss of toxic residue showed that after 12 days the residues of DDT and methylchlor were 12-14% and 6.9-7.5%, respectively, of the initial residues. In fruits the residues of DDT and methylchlor after 12 days were 21-37% and 15-23%, respectively, of the initial values.

75-1530. Polizu, A.; Serban, V. (Inst. Cercet. Prot. Plant., Bucharest, Romania). **Reziduuri organoclorurate determinate in sol si in culturile de griu si porumb din Sudal Tarii. [Organochlorine residues determined in the soil and in the wheat and corn crops of South Romania.]** *An. Inst. Cercet. Prot. Plant Acad. Stiinte Agric. Silvice* 10: 479-485; 1974. (4 references) (Romanian)

A study was initiated in 1972 on the level of organochlorine pesticide pollution in wheat and corn and in the soil in which these crops were cultivated. Determination of organochlorine residues by gas chromatography revealed the total residue accumulation in the soil to be between 0.02 and 0.68 ppm (0.18 ppm average). In all soil samples, α-BHC and γ-BHC (lindane) were detected; DDT and dieldrin were determined at 61% and 52%, respectively, of the sampling sites; and DDE and aldrin were detected in only a few samples. Organochlorine residues in wheat ranged between 0.06 and 0.83 ppm (0.21 ppm average). The total residue in corn ranged between 0.10 and 0.33 ppm (0.2 ppm average). The accumulation of organochlorine residues in wheat and corn was found to be proportional to the amount of residue occurring in the soil and represented a 1- to 2-fold increase over soil residue content.

75-1531. Floru, S.; Isac, M. (Inst. Cercet. Prot. Plant., Bucharest, Romania). **Persistenta reziduurilor de dimetoat pe fructe si legume. [Persistence of dimethoate residues in fruits and vegetables.]** *An. Inst. Cercet. Prot. Plant. Acad. Stiinte Agric. Silvice* 10: 487-490; 1974. (5 references) (Romanian)

Tests were conducted to establish the waiting period to be observed between treatments with the Romanian product Fosfotox R, containing dimethoate. The pesticide was extracted from plant material with acetone, and cleanup comprised successive extractions with chloroform. Determinations were made by thin-layer chromatography on silica gel G with a solution of palladium chloride as chromogenic agent. On the basis of these determinations and of the fact that in Romania the acceptable tolerances for dimethoate are 1.5 ppm in fruits and 2 ppm in vegetables (except for tomatoes, in which 1 ppm is acceptable), the following waiting periods are recommended: 7 days for tomatoes, cucumbers and eggplants in the field, and 14 days for cherries.

75-1532. Floru, S.; Isac, M. (Inst. Cercet. Protect. Plant., Bucharest, Romania). **Reziduuri de alar pe mere. [Alar residues on apples.]** *An. Inst. Cercet. Prot. Plant. Acad. Stiinte Agric. Silvice* 10: 491-494; 1974. (1 reference) (Romanian)

Jonathan apples in commercial orchards were treated with 1, 2, or 3 applications of 0.2% Alar in July and August of 1971 and 1972. Apple samples were stored and analyzed in January 1973. Residues ranged between 2.12 and 4.15 ppm in variants receiving a single treatment. Those receiving two treatments showed residual values of 3.40 ppm, and residues ranged between 5.95 and 9.10 ppm in samples receiving three treatments. Distribution of Alar residues was determined by separate analyses of the rind and pulp. In the rind, residues ranged between 7.07 and 14 ppm, and in pulp between 3.30 and 8.10 ppm.

75-1533. Metcalf, R. L.; Sanborn, J. R.; Lu, P. Y.; Nye, D. (Dep. Entomol. and Environ. Studies Inst., Univ. Illinois, Urbana, IL 61801). **Laboratory model ecosystem studies of the degradation and fate of radiolabeled tri-, tetra-, and pentachlorobiphenyl compared with DDE.** *Arch. Environ. Contam. Toxicol.* 3(2): 151-165; 1975. (23 references)

Radiolabeled tri-, tetra-, and pentachlorobiphenyls (PCB) and DDE were studied in a laboratory model ecosystem for degradation pathways and biomagnification in alga, snail, mosquito, and fish. Trichlorobiphenyl was degraded in all the organisms of the model ecosystem much more rapidly than tetrachloro- and pentachlorobiphenyl. Pentachlorobiphenyl was approximately as persistent as DDE. There was a linear relationship between lipid/water partition and ecological magnifi-

cation and between water solubility and ecological magnification. No evidence of conversion of DDE to PCB was detected. (Author abstract by permission)

75-1534. Frank, R.; van Hove Holdrinet, M.; Rapley, W. A. (Provincial Pestic. Residue Testing Lab., Ontario Min. Agric. Food, Ottawa, Ontario, Canada). **Residue of organochlorine compounds and mercury in bird's eggs from the Niagara Peninsula, Ontario.** *Arch. Environ. Contam. Toxicol.* 3(2): 205-218; 1975. (21 references)

Eggs (307) were collected in 1971 from twenty species of birds with a variety of feeding habits from the Niagara Peninsula. This area of Ontario is intensively developed for agriculture and heavy industry and has a large urban population. Representative species were obtained from both the terrestrial and aquatic food chains. Eggs were analyzed for organochlorine insecticides, polychlorinated biphenyls, and total mercury. Eggs from carnivorous species at the top of the aquatic food chain had the highest mean residues of ΣDDT (7.6 to 22.4 ppm), PCB (3.5 to 74.0 ppm) and total mercury (0.64 to 0.83 ppm). Eggs from some terrestrial carnivores (red-tailed hawk and great horned owl) also had relatively high residues (2.5 to 3.9 ppm of ΣDDT, 0.2 to 1.0 ppm of PCB, 0.06 to 0.09 ppm of mercury); however, levels were much lower than those found in eggs from aquatic-feeding carnivores. Eggs from one red-shouldered hawk had residues comparable to the aquatic-feeding carnivores. Eggs from herbivorous and insectivorous birds of both aquatic and terrestrial environments contained much lower residues. PCB residues were slightly lower in eggs among the terrestrial feeding species (0.05 to 2.0 ppm) than among the aquatic feeders (9.14 to 4.0 ppm) and tended to be lower in eggs from terrestrial species collected in rural than in city environs. Levels of ΣDDT were similar in both groups with eggs from terrestrial feeders containing mean residues between 0.15 and 2.64 ppm and those from aquatic feeders between 0.33 and 2.79 ppm. (Author abstract by permission)

75-1535. Berck, B.; Corte, G.; Monkman, J. L. (Crop Protection Section, Agr. Canada, Research Station, Winnipeg, Manitoba, Canada). **Volatility of fungicidal mercury on wheat seeds.** *Arch. Environ. Contam. Toxicol.* 3(2): 219-228; 1975. (17 references)

The volatility of two fungicidal seed dressings, Panogen 15 B liquid and Panogen PX powder, containing methyl mercuric dicyandiamide in equivalent amounts at the dosage used, was compared with that of triple distilled mercury. Tests were made in the absence and presence of cleaned Manitou wheat of 12.0% and 17.1% moisture content. The Panogen formulations were compared at the recommended and twice the recommended rate at different dosages, storage periods and storage temperatures. The Hg content of air samples was determined by the Corte-Monkman method, capable of determining 0.4 ng of Hg, which in a one-liter air sample is equivalent to 0.049 ppb (v/v). The volatility of the interstitial air expressed as μg of Hg vapor/m^3 air depended on temperature, wheat moisture content and storage duration and ranged from 150 to 2,240 for metallic Hg, 21 to 350 for Panogen 15 B, and 31 to 380 for PX. In the absence of wheat, the volatility of 15 B was greatest (395) at -17.5°C and least (75) at 4.5°C, but increased rapidly thereafter with increased temperature. Volatility of metallic Hg after application to wheat of 12.0% and 17.1% moisture content was not significantly reduced after four days storage, but that of Panogen 15 B and PX was reduced considerably, particularly at the higher moisture level. Thus, volatility of mercurial seed dressings cannot be predicted from Hg content alone. Reduction of volatility through possible irreversible chemical bonding of Hg with seed components is suggested for more detailed investigation. (Author abstract by permission)

75-1536. Begliomini, A.; Fravolini, A. (Ist. Zooprofil. Sper. Umbria e Marche, Perugia, Italy). **Residui di insetticidi nei mangimi - IV. Idrocarburi clorurati ed esteri fosforici nelle farine di pesce, orzo, granoturco e soia di provenienza estera. [Pesticide residues in animal feeds IV. Chlorinated and phosphated pesticides in fish meals and in barley, corn and soybean flour of foreign origin.]** *Arch. Vet. Ital.* 24(5-6): 183-190; 1973. (2 references) (Italian)

One hundred samples of foreign-produced animal feeds were analyzed in order to determine the pesticide contamination level. Tests were carried out on 25 fish meals (Chile, Peru, Denmark); 25 soybean meals (USA, Brazil, Argentina); 25 samples of corn meal (USA, Argentina, Canada, Brazil); and 25 samples of barley flour (USA, Canada). This investigation involved BHC, lindane, heptachlor, aldrin, heptachlor epoxide, *o,p'*-DDE, *p,p'*-DDE, *p,p'*-DDD, *o,p'*-DDT, *p,p'*-DDT, methoxychlor, methyl parathion, parathion, *n*-butylester of 2,4,5-T, *n*-butylester of 2,4-D, isobutylester of 2,4-D, dieldrin, and endrin. All were analyzed by gas chromatography. Percentages and quantities in relation to the country of origin are reported.

75-1537. Schultz, C. D.; Yauger, W. L., Jr.; Bevenue, A. (Dep. Agric. Biochem., Univ. Hawaii, Honolulu, HI 96822). **Pesticides in fish from a Hawaiian canal.** *Bull. Environ. Contam. Toxicol.* 13(2): 206-208; 1975. (7 references)

The degree of pesticide contamination in two species of fish (the ten pounder, *Elops hawaiensis*, and the milkfish, *Chanos chanos*), algae (*Ulva* and *Pithophora*), guppies (*Lebistes reticulatus*), mollies (*Molienisia sphenops*), sediment, and water from the Ala Wai Canal in Honolulu was determined using electron capture gas chromatography. DDE, DDD (TDE), DDT, and dieldrin were found in all samples. The total residue levels averaged .015 ppb in the water, 0.12 ppm in the algae, 0.27 ppm in the sediment, 0.62 ppm in the guppies, 0.55 ppm in the mollies, 1.20 ppm in *Elops* brain, 3.07 ppm in *Elops* liver, 0.99 ppm in *Elops* muscle, 1.96 ppm in *Chanos* brain, 0.22 ppm in *Chanos* liver, and 1.10 ppm in *Chanos* muscle. In general dieldrin showed the highest residue levels, followed by TDE, DDT, and DDE. The data indicates that small fish remove DDT from water more efficiently than large fish, that large fish remove pesticides more efficiently from their diet, and that algae are efficient accumulators of pesticide residues and may be a partial

source of residues in fish found in waters which contain only trace amounts of pesticides.

75-1538. Sellers, L. G.; Dahm, P. A. (Dep. Zool. Entomol., Iowa State Univ., Ames, IA 50010). **Chlorinated hydrocarbon insecticide residues in ground beetles (*Harpalus pensylvanicus*) and Iowa soil.** *Bull. Environ. Contam. Toxicol.* 13(2): 218-222; 1975. (9 references)

Electron capture gas chromatography and thin-layer chromatography were used to determine the levels of chlorinated hydrocarbon insecticides in carabid beetles obtained during the summer of 1973 from Iowa cornfields. The following residues were found: aldrin (7.3 ng/gm wet weight); dieldrin (39.4 ng/gm); heptachlor (2.6 mg/gm); heptachlor epoxide (9.0 ng/gm); *p,p'*-DDE (88.3 ng/gm); and *p,p'*-DDT (2.8 ng/gm). The high DDE levels were surprising in that DDT had not been used on the field for several years. The insecticide residues did not increase linearly with the lipid content of the beetles. Analysis of soil samples taken near the beetle-collecting sites revealed amounts of aldrin and dieldrin similar to those found in the beetles, higher levels of DDT, and lower levels of DDE; no heptachlor or heptachlor epoxide was detected in the soil samples.

75-1539. Que Hee, S. S.; Sutherland, R. G.; McKinlay, K. S. (Dep. Chem. Chem. Engr., Univ. Saskatchewan, Saskatoon, Saskatchewan, Canada S7N OWO). **Factors affecting the volatility of DDT, dieldrin, and dimethylamine salt of (2,4-dichlorophenoxy) acetic acid (2,4-D) from leaf and glass surfaces.** *Bull. Environ. Contam. Toxicol.* 13(3): 284-290; 1975. (15 references)

The volatility of DDT, dieldrin, and 2,4-D from leaf and glass surfaces was investigated. Droplets of approximately the same diameter on both glass and leaves were equally volatile for DDT (40-46%), but for dieldrin droplets on glass (70%) were significantly more volatile than on leaves (54%). The low recoveries for the leaf experiments may imply that some pesticide had penetrated the leaves. The 2,4-D amine salt was much less volatile than DDT or dieldrin. The percentage volatilities for all substrates from thick films of formulations were much lower than for droplets in thin film experiments, although the absolute rates of volatilization were higher. The high absolute rates of volatilization may be ascribed to the air stream being closer to saturation because of the larger applied dose.

75-1540. Cahill, W. P.; Estesen, B.; Ware, G. W. (Dep. Entomol., Univ. Arizona, Tucson, AZ). **Foliage residues of insecticides on cotton.** *Bull. Environ. Contam. Toxicol.* 13(3): 334-337; 1975. (1 reference)

The rate of disappearance of the dislodgable residues of certain organophosphate insecticides from cotton leaf was confirmed and the quantities of dislodgable methyl and ethyl parathion residues obtained by water vs. benzene extraction were compared. The rates of disappearance of the dislodgable residues correlate well with the previous study except for the three most persistent compounds. The rates of disappearance are methomyl > chlordimeform > methyl parathion = toxaphene + methyl parathion = methyl parathion + parathion > parathion = parathion + methyl parathion > monocrotophos = azinphosmethyl > methyl parathion encapsulated. Previous results for the last three compounds indicated azinphosmethyl > methyl parathion encapsulated > monocrotophos. Different techniques may explain the differences. The benzene rinses of the parathions contained more residue than the water rinses. The benzene rinses contained from 2-3 times the parent compounds and 5-10 times the oxons in the water rinses. It is probable that the real dislodgable residue as it applies to field workers is intermediate between that which can be removed by benzene and water extractions.

75-1541. Staiff, D. C.; Comer, S. W.; Armstrong, J. F.; Wolfe, H. R. (Field Studies Sect., Pestic. Toxic Subst. Effects Lab., EPA, Wenatchee, WA 98801). **Persistence of azinphosmethyl in soil.** *Bull. Environ. Contam. Toxicol.* 13(3): 362-368; 1975. (6 references)

The persistence of azinphosmethyl residues in soil following topical applications of the compound was determined. Treatments were made in field soil plots using three liquid azinphosmethyl concentrations and two different formulations. The persistence of azinphosmethyl in sandy loam soil following gross topical contamination with 18.1% liquid emulsifiable concentrate formulation is tabulated. The levels of pesticide in the soil, initially very high (25,570 to 70,994 ppm at the 0-2.5 cm level and 20,810 to 52,250 ppm at the 2.5-7.5 cm level), decreased to between one half and one third of their original values by the end of the first year. From the second year and beyond, the rate of disappearance was considerably less but appreciable quantities still remained in both the top 2.5 cm and at the 2.5 and 2.5-7.5 cm levels through the end of the third year. From the 4th year through the 8th year the pesticide residues in the lower level (2.5-7.5 cm layer) were consistently higher than in the top level (0-2.5 cm layer). The levels of azinphosmethyl at concentrations of 0.045% and 0.36% dropped off quite rapidly during the first year with relatively small amounts thereafter.

75-1542. Wolfe, H. R.; Armstrong, J. F.; Staiff, D. C.; Comer, S. W. (Pestic. Toxic Substances Effects Lab., EPA, Wenatchee, WA 98801). **Potential exposure of workers to parathion through contamination of cigarettes.** *Bull. Environ. Contam. Toxicol.* 13(3): 369-376; 1975. (5 references)

The potential parathion contamination of cigarettes by spray drift and through contact with hands during pesticide application or fruit-thinning activities was determined. The greatest contamination of a cigarette during normal spray operations that did not involve noticeable contamination of hands with emulsifiable concentrate was 19.1 μg. The highest contamination value was 235.6 μg per cigarette where contact was with emulsifiable concentrate material. Washing of hands was fairly effective but did not prevent cigarette contamination up to 1.2 μg during handl-

ing and smoking following contamination with 45.6% emulsified concentrate parathion. The maximum spray drift contamination of cigarettes carried in the shirt pocket during spraying was 2.3 μg. Maximum contamination of cigarettes fully exposed to conventional 0.03% dilute spray drift or thoroughly soaked in dilute spray solution was 37.3 μg. Penetration to the tobacco was 33.4% of the total contamination with dry hands and 55.6% with moist hands. The values do not indicate any great hazard during most exposure situations.

75-1543. Oloffs, P. C.; Hardwick, D. F.; Szeto, S. Y.; Moerman, D. G. (Dep. Biol. Sci., Simon Fraser Univ., Burnaby, B.C., Canada). **DDT, dieldrin, and heptachlor epoxide in humans with liver cirrhosis.** *Clin. Biochem.* 7(3): 297-306; 1974. (19 references)

Gas-liquid chromatography was used to determine the DDT, dieldrin, and heptachlor epoxide concentrations in liver, brain, and adipose tissue specimens taken at autopsy from patients with hepatic cirrhosis and from controls. Sections of liver were prepared for histopathological examination and the lipid content determined. The liver specimens from the cirrhotics contained significantly higher concentrations of DDT, but significantly lower concentrations of heptachlor epoxide than the control specimens: the dieldrin concentrations did not vary significantly between the two groups. The groups did not differ in terms of the pesticide residue levels in the brain or adipose tissue samples. None of the specimens contained detectable amounts of aldrin, heptachlor, lindane, or the α or γ isomers of chlordane. The cirrhotic livers with severe fatty infiltration contained significantly higher amounts of DDT and heptachlor epoxide than did those with minimal or no fatty changes. On the other hand, livers with marked fibrosis or bile stasis contained significantly lower concentrations of DDT than those with minimal or no such changes.

75-1544. Shimamoto, T.; Matsueda, H.; Yoshinouchi, M.; Okinaga, E.; Mori, K.; Yamatake, S.; Nakajima, S.; Aihara, M. (Ehime Prefect. Inst. Hyg. Sci., Matsuyama, Ehime, Japan). [**Results of a survey on PCB and organochlorine pesticide residues in mothers' milk.**] *Ehime-Kenritsu Eisei Kenkyusho-Ho (Annu. Rep. Ehime Prefect. Inst. Hyg. Sci.)* 35: 71-73; 1973. (6 references) (Japanese)

Seven specimens of milk collected from lactating women in Matsuyama City one to 4 months after delivery on Aug. 13, 1973 were analyzed for PCB and organochlorine pesticide residues such as α-, β-, γ-, and δ-BHC, *p,p'*-DDT, *p,p'*-DDE, *o,p'*-DDT, dieldrin, aldrin, and endrin. Gamma- and δ-BHC, *p,p'*-DDD, *o,p'*-DDT, aldrin, and endrin were not detected; α-BHC was detected in trace amounts in 4 specimens; β-BHC was 0.109 ppm (average); and *p,p'*-DDT was 0.016 ppm (average). *p,p'*-DDE was 0.049 ppm (average) and dieldrin was 0.002 ppm (average). The amounts of BHC and dieldrin did not differ significantly from those found in 1970 and 1971; total DDT, however, showed a small increase.

75-1545. Anonymous. [**Determination of pesticide residues in vegetables and fruits produced in Ehime Prefecture, part 3.**] *Ehime-Kenritsu Eisei Kenkyusho-Ho (Annu. Rep. Ehime Prefect. Inst. Hyg. Sci.)* 35: 110-111; 1973. (Japanese)

Forty-five specimens of crops (consisting of 16 species of vegetables and fruits including tomato, potato, cucumber, tea leaves, kidney bean, strawberry, summer orange peel and pulp, peach, Satsuma orange, rice, wheat, maize, etc.) produced in Ehime Prefecture in 1973 were inspected for residues of pesticides for which official standards have been established. The results were that there were no specimens in which the pesticide residues were more than the standards, and the pesticide detected was malathion in only one specimen of strawberry. Total-BHC was detected in 30 specimens; however, the amount tended to decrease as compared to amounts detected in 1972. Total-DDT was detected in a few specimens; the amount, again, decreasing. The crops for which the standards were newly established and which were inspected were sweet potato, wheat grain, kidney bean, and maize.

75-1546. Egan, H. (Lab. Govern. Chem., London, England). **Pesticide residues in food — the situation today.** *In: Environmental Quality and safety, Vol. 2.* F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 78-87. (47 references)

The amount of pesticide residue ingested by man was estimated by individual commodity and dietary studies. Total diet studies were developed principally in the United States and in the United Kingdom and relate mainly to the organochlorine compounds. They do not suggest any progressive increase in the levels of ingestion. The average levels of total DDT in meals in the United States measured 15 yr ago suggested a daily intake of about 0.25 mg. Recent values indicate less than ½ this level, while even lower levels are found in Great Britain. Average dieldrin residue levels in Britain have fallen in recent years as measured both by selective commodity studies and by mean and total studies. Approximately ⅓ of the total DDT derived residue in prepared food is present as DDE, and while the separate measurement of DDT and DDE residues is more accurate than it was 15 yr ago, the significance of DDE residues is not appreciated. DDE is also associated with DDT residues where these occur in avian and other wildlife specimens. This can affect sterol degradation with possible influence on calcium balance resulting in the production of thin shelled eggs.

75-1547. Hurtig, H. (Canada Dep. Agric., Ottawa, Canada). **Chemicals in the environment—some aspects of agricultural chemicals.** *In: Environmental Quality and Safety, Vol. 2.* F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 88-99. (5 references)

The possibilities of the experimental investigation of various factors and how environmental chemicals influence environmental quality are discussed. The limitations and necessary knowledge are shown with the example of three case studies in Canada on the mercury problem in

agriculture, the transport of pesticides in the atmosphere, and a ring analysis on pesticide residues. Mercury is used as a broad spectrum fungicide which controls many fungus problems. Its use is gradually being discontinued for these purposes except for turf diseases. Fluctuations of specific meteorological elements such as temperature, humidity, wind, and radiation cause a variety of physical and chemical reactions that probably affect the measurable end result, the amount of pesticides detected on plant and soil samples. There is no comprehensive Canadian or international body of statistical data on pesticide types, released amounts and release times in relation to geographic areas. A uniform national system of reporting pesticide use appropriate to quantitative treatment of the pesticide transport problem should be initiated. Check sample programs on pesticide residue analysis for soil, animal feed, and human food were developed. The number of laboratories participating varies on each program annually, but averages 25.

75-1548. Ashdown, D.; Beal, H. R.; Diser, D. (Entomol. Sect., Texas Tech. Univ., Lubbock, TX). **Some noncontrol effects of 4 systemic insecticides applied to potatoes 1970-1971.** *Folia Entomol. Mex.* (25-26): 71; 1973.

Planting-time application of granular systemic insecticides is routinely practiced to control the potato psyllid, *P. cockerelli*. Studies are reported on disulfoton, phorate, carbofuran, and Nemacur applied to commercially grown potatoes in West Texas. Phytotoxicity and residues in the harvested potatoes were determined. Insect infestations did not develop. Application (as side dress treatments or at planting time) of label rate or two, four, or eight times label rate treatments did not affect vine growth, leaf margin color, or tuber surfaces. Residues in harvested tubers were 0.4 ppm or less in all samples at the highest (8-fold) rates and were considered to indicate very high safety factors for both phytotoxicity and chemical residues. The higher rates of application also resulted in significantly improved yields in the 1970 tests. Phytostimulation was found to be a fairly regular phenomenon, although the high levels were not repeated in the 1971 tests at two Texas locations.

75-1549. Finlayson, D. G.; Suett, D. L. (Res. Stn., Canada Agriculture, Vancouver, British Columbia, Canada). **Persistence and bioactivity of chlorfenvinphos in carrots and soil in greenhouse experiments.** *J. Econ. Entomol.* 68(2): 140-142; 1975. (5 references)

Carrots were grown in pots of soil treated with chlorfenvinphos (2-chloro-1-[2,4-dichlorophenyl] vinyl diethyl phosphate) at 5, 10, 20, and 40 ppm. At 4, 8, and 12 wk after seeding, carrots from treated soil were transplanted into untreated soil and carrots from untreated soil were transplanted into treated soil. Residues in the soil remained relatively constant over the 18-wk period averaging 4.4, 8.2, 16.0, and 34.0 ppm respectively. Residues in the carrots (μg/carrot) were greatest after 18 wk, whereas concentration (ppm) decreased, a result of dilution by plant growth. Only slight damage by larvae of carrot rust fly, *Psila rosae* (F.) occurred in carrots in treated soil, but when transplanted to untreated soil at 12 wk the residues in the carrots were insufficient to prevent all damage. Untreated carrots averaged 47.8% damage. (Author abstract by permission)

75-1550. Novozhilov, K. V.; Volkova, V. A.; Rozova, V. N. (All-Union Inst. Plant Protection, USSR). **Dinamika razlozheniya fosfamida v rasteniyakh i pochve. [Dynamics of phosphamide decomposition in plants and soil.]** *Khim. Sel. Khoz.* 12(3): 199-201; 1974. (8 references) (Russian)

Methods for the determination of phosphamide (dimethoate) in soil and plants and studies on its residue dynamics in soil and plants are described. Phosphamide is determined in the soil by thin-layer chromatography using Silufol foil, and 2,6-dibromo-*N*-chloro-*n*-quinone imine for visualization. Phosphamide residues in plants were determined by photocolorimetric analysis of the phosphorus content. Most of the phosphamide applied in the soil was concentrated in the upper 5 cm layer, up to 25% was found in the 5-15 cm layer, and up to 8% in the 15-30 cm layer. The rate of degradation in the soil was a function of the water content: total degradation took 21 days in a soil with 29% water, 43 days at 13% water content, and 75 days at 5% water content. Phosphamide was more persistent when applied in granulated form, which calls for an increase in the required waiting period.

75-1551. Konstantinov, O. K.; Gorchakovskaya, N. N. (Inst. Poliomyelitis and Viral Encephalitis, Acad. Med. Sci. USSR, Moscow, USSR). **O soderzhanii ostatkov DDT v pochve posle protivoklieshchevykh obrabotok tayezhnykh ochagov kleshchevogo entsefalita. [Level of DDT residues in soil after antitick treatment of taiga foci of tickborne encephalitis.]** *Med. Parazitol. Parazit. Bolez.* 42(3): 298-304; 1973. (43 references) (Russian)

The persistence, distribution, and metabolism of DDT in soils of taiga foci of tickborne encephalitis in the northern Kemerovo region was studied following aerial application of 10% DDT dust at rate of 50 kg/ha (equaling 5 kg active agent per ha) for tick control. Up to 98.7% of all DDT was found to be confined to the upper 10 cm soil layer, which indicates the absence of groundwater contamination hazards. The DDT was washed down from higher places by rain and snow water to lowlands where it was found in concentrations up to 7 times that found in lowlands (1.6 kg/ha as opposed to 0.22 kg/ha on hills). The total DDT residue decreased by about 72% from 0.56 kg/ha to 0.15 kg/ha in 14 years. Benthic sediments in creeks contained 0.05 to 0.16 mg DDT per kg. The DDT residue was metabolized to less toxic DDE at a rate of 44%. The DDE residue level was 0.03-0.14 kg/ha, localized mainly in the upper 10 cm layer of the soil. The DDD (TDE) level in the soil was determined to be 0.01-0.07 mg/ha. This metabolite was found mainly in sites with anaerobic conditions.

75-1552. Love, J. L.; Donnelly, R. G. C.; Hughes, J. T.; Wilson, P. D. (Chem. Div., Dep. Sci. Ind. Res.,

Petone, New Zealand). **Pesticide residues in fruit and vegetables in New Zealand 1971-73.** *N. Z. J. Sci.* 17(4): 529-534; 1974. (7 references)

Fruit and vegetables purchased in 1971-1973 throughout New Zealand were analyzed for residues of organochlorine and organophosphorus pesticides. The compounds that were detected as residues are tabulated. The maximum residue found for each compound on each crop type in the 3-year period is shown, together with the average of the detected residues. About 40% of the samples analyzed had detectable residues. About 3% of the samples had residues in excess of the New Zealand tolerances prevailing at the end of 1973. The pesticides present in excess and the produce involved include: omethoate in pip and stone fruits; TDE in citrus and stone fruits; DDT in leaf and root vegetables; dimethoate in citrus fruit; dicofol in leaf vegetables; methyl parathion in citrus fruits and root vegetables; mevinphos in berry fruits; and diazinon in citrus fruit. Many of the high residues detected were only slightly in excess of the regulation limit and probably reflect variations in climate and application technique.

75-1553. Hafner, M.; Michel, H. G. (Landesanst. Pflanzensch., Stuttgart, Germany). **Untersuchungen zur Abtrift des Schwefels und zum Rueckstandsverhalten auf Pflanzlichem Material (Rotklee und Apfelblaetter, Sorte: "Golden Delicious").** [**Investigations on the drift of sulfur and its metabolism on plants (red clover and apple leaves from the variety "Golden Delicious").**] *Nachrichtenbl. Dtsch. Pflanzenschutzdienst (Braunschweig)* 27: 24-27; 1975. (5 references) (German)

When sulfur was applied with a turbulator, drift could be demonstrated at distances of 2, 5 and 10 m. The residual amount found at 2 and 5 m (80.5 and 76.5 ppm, respectively) exceeded the permitted amount of 50 ppm. When sulfur was applied with a spray-gun, only mild drift was observed at distances of 2 and 5 m (14.2 and 4.2 ppm, respectively), and results were acceptable. Application with the turbulator occurred against wind direction, while application with the spray-gun was made during a lull. Because of the high tolerance to sulphur and its rapid metabolism (perhaps caused by the rapid growth of clover), no major adverse effects occurred. This result cannot be applied to other situations because of such variable factors as wind direction and velocity, formulation and active ingredients of the pesticide, and geometry of the field.

75-1554. Muller, H. W. K. (Inst. Angew. Bot. Univ. Hamburg, Hamburg, Germany). **Zur Bekaempfung der Erdbeer-Verticilliose durch Benomyl. 3. Mitteilung.** [**The control of verticillium wilt of strawberry with benomyl. 3rd report.**] *Nachrichtenbl. Dtsch. Pflanzenschutzdienst (Braunschweig)* 27: 33-38; 1975. (14 references) (German)

The preventive control of *Verticillium* wilt in strawberry by dipping runners (root and foliage) in 0.2%-0.3% benomyl for 15-30 minutes was found to be very effective. After planting in soil drenched with a benzimidazole (benomyl, carbendazol, carbendazim, cypendazol) or a thiophanate (thiophanate-methyl) 0.2 at 0.3%, 1 liter per 1 m row, effective control and good yields were obtained. Dusting plant holes (3 per 1 m) with 0.6 g w. p. generally gave a smaller yield. However, the best yield was in the second year if amounts of benomyl ten times higher (6 g per hole) are used with the needed material for soil drenching with benomyl 0.2%. Unfortunately, in this case problems of economic value and toxic residues occur. Toxic residues in fruit ten months after treatment with carbendazol (runner dip, soil drench, plant hole dust) were very low (BCM 0.1-0.15 ppm) and below the tolerance level of 1.5 ppm.

75-1555. Usuya, S.; Nishiyama, K.; Sato, K. (Sch. Publ. Health, Fac. Med., Hirosaki Univ., Hirosaki, Aomori, Japan). [**Concentration of pesticides in inhaled air during application and its significance.**] *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 30(1): 148; 1975. (16 references) (Japanese)

The atmospheric concentration of organophosphorus pesticides during application was determined via human respiration, and the data was compared to the data which had been obtained by mechanical aspiration. The present data ranged broadly from 0.066 to 390 mg/m^3; large fluctuations were primarily due to wind. The amounts of pesticide inhaled by personnel during application with an impinger were determined via human respiration. The data obtained ranged from 0.01 to 1.27 mg/hr; these findings were not very different from those obtained by filter-pad studies of human respiration.

75-1556. Yamashita, S.; Nishijima, O.; Kawahara, T.; Nakamura, H. (Agr. Chem. Inspect. Stn.,Tokyo, Japan). [**Pesticide residues in Strawberries. Part 1. Quinomethionate and captan.**] *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Inspect. Stn.)* 14: 38-41; 1974. (Japanese)

Residues of quinomethionate (6-methylquinoxaline-2,3-dithiocarbonate) and captan on/in strawberries at 1, 2, 4, and 7 days after the last application (5 times, once a week) in the case of the former and at 26 days after the last application in the case of the latter (2 times in 3 days) were determined by extracting with acetone (quinomethionate) or acetonitrile (captan), transferring to *n*-hexane (quinomethionate) or petroleum ether-methylene chloride-acetonitrile mixture (captan), then gas chromatography (15% QF-1 + 10% DC-200/ Chromosorb W for quinomethionate and 5% QF-1/gas chrom Q for captan). The residues of quinomethionate after 5 applications slowly decreased; 0.9 - 0.5 - 0.4 - 0.2 ppm at one, 3, 7 and 14 days after the last application (official tolerance not more than 0.5 ppm). The residues of captan were 1.5 and 2.4 ppm. An official tolerance for captan has not yet been established on strawberries; however, it is 5 ppm in/on other crops.

75-1557. Fusi, P.; Franci, M. (Ist. Chim. Agrar. For., Univ. Florence, Florence, Italy). **Controllo chimco e biologico dei residui di pyrazon nel terreno.** [**Chemical and biological determination of pyrazon residues in soil.**] *Not. Mal. Piante* 87(14): 21-29; 1972. (5 references) (Italian)

Chemical and biological investigations of pyrazon residues in soil have been carried out. The results show the possibility of growing a sensitive crop in pyrazon treated loamy soil when the total herbicide residues, chemically determined, are equal to or less than 0.20 ppm. Tests were conducted using grain and maize. Upon treating soil with 3.7 ppm (5.0 kg/ha) of pyrazon, the average value declined from 2.76 ppm after one month to 0.39 ppm after 5 months. Treatment with 2.2 ppm (3.0 kg/ha) yielded average results of 1.52 to 0.12 ppm, and with 1.1 ppm (1.5 kg/ha) a decline from 0.75 to 0 ppm for the same time intervals. Consequently, soil treated with 1.5 kg/ha could be used after 4 months, that with 3.0 kg/ha after 5 months, and that with 5.0 kg/ha much later.

75-1558. Cullen, G. R. (Agric. Chem. Distribution Control Board, Brisbane, Australia). **Weedkiller application requires caution.** *Cane Growers Quart. Bull.* 38(3): 87-88; 1975.

Hazards to sugar cane crops and garden plants caused by spray and vapor drift from careless application of weedkiller are discussed. The amount of spray drift depends upon the size of the spray droplets, the strength of the wind, and the height from which spray is released. Volatility of 2,4-D and other phenoxyacetic compounds used commonly by cane growers, such as 2,4,5-T, is of special importance. Problems arise when ester formulations are used because vapors of these chemicals can move from the treated area for several days after application. Amine and sodium salts of 2,4-D have little or no volatility hazard. The incidence of accidental chemical damage to susceptible crops and plants could be greatly reduced by more cooperation between cane growers and licensed commercial operators and agricultural pilots with pilot chemical rating licenses.

75-1559. Del Vecchio, V.; Leoni, V.; Puccetti, G.; Simeone, A. M.; Caratozzolo, C.; D'Alessandro De Luca, E. (Ist. Igine "G. Sanarelli", Univ. Rome, Rome, Italy). **Indagini sul contenuto di pesticidi cloro-organici in diete totali in Italia. Parte II: Alimenti preparati e pronti al consumo. [Studies on the content of organochlorine pesticides in the Italian diet. Part II. Prepared foods ready for consumption.]** *Nuovi Ann. Ig. Microbiol.* 24(2): 87-115; 1973. (7 references) (Italian)

Research was carried out on 555 portions of prepared foods (representative of the weekly dietary consumption) from a mess of the Italian Navy in Naples. Analytical determinations were carried out by gas chromatography techniques. The pesticide intake depended on the nutritional choice which the consumer would make. The average, highest, and lowest data for intake, expressed in μg/man/day, were as follows: total BHC (all isomers) 16.7 (8.1-33.8); γ-BHC (lindane) 5.4 (2.5-11.6); aldrin/dieldrin 2.8 (1.0-4.2); heptachlor/heptachlor-epoxide 8.2 (0.8-19.5); chlordane 0.7 (n.d.-4.9); total DDT equivalents (isomers and metabolites) 35.4 (17.2-59.9). On the average, these data were a fraction (0.7% for lindane and 46% for dieldrin) of the acceptable daily intake proposed for a man of 60 kg body weight by the FAO-WHO Committee for 1971.

75-1560. Del Vecchio, V.; Leoni, V. (Ist. Igiene "G. Sanarelli", Univ. Rome, Rome, Italy). **Indagini sul contenuto di pesticidi cloro-organici in diete totali in Italia. Parte III. Dosi di pesticidi assunte con la dieta, dosi giornaliere accettabili ed attuali settori d'impiego di alcuni pesticidi. [Study on the content of chloro-organic pesticides in the total diet in Italy. 3. Doses of pesticides taken with the diet, acceptable daily doses and current sectors of the use of some pesticides.]** *Nuovi Ann. Ig. Microbiol.* 24: 191-196; 1973. (65 references) (Italian)

Some theoretical principles which apply to the field of pesticide hygiene and to the problem of the acceptable daily intake are presented together with results obtained through research on the presence of chlorinated pesticides in total-diet samples. The exposure data to BHC, aldrin, dieldrin, heptachlor, heptachlor epoxide, chlordane, and DDT obtained for the Italian population are compared to those obtained for populations of other countries. For dieldrin, the concentration of the pesticide in human adipose tissue is related to the amount ingested with food. On the basis of available data, a decrease in exposure of the Italian population to some chlorinated pesticides was calculated from 1966 to 1973. Dieldrin intake dropped from 20.8 μg/person/day in 1966 to 9.2 in 1973. The levels of residues in food are related to the most important areas of application of these pesticides in Italy, and some measures to reduce food contamination are suggested. While the dietary intake of each pesticide was lower than the respective acceptable daily intake proposed by the FAO-WHO Joint Committee, the total intake of these products must be considered a limiting value. Thus, it is considered necessary to reduce the levels of contamination, particularly in foods of animal origin. Foods and related raw materials of foreign origin should be subject to analysis and subsequent strict control.

75-1561. Crisetig, G.; Cortesi, P.; Carpene, E. (Ist. Biochim., Fac. Med. Vet., Univ. Bologna, Italy). **Residui di pesticidi clorurati e bifenili policlorurati in gonadi di clupeiformi Adriatici. [Residues of organochlorine insecticides and polychlorinated biphenyls in mature gonads of clupeiformes from the Adriatic Sea.]** *Nuova Vet.* 49(3): 144-149; 1973. (37 references) (Italian)

Data is presented concerning the concentrations of insecticide residues and polychlorinated biphenyls (lindane, DDE, DDT, and DDD) in mature female gonads of Clupeiformes from the Adriatic Sea [*Sardina pilchardus* (Walb.), *Engraulis encrasicholus* L. and *Clupea sprattus* L.]. The values of the residues found during periods of "gonadic activity" are rather low (0.558 ppm in the sardines, 0.184 in anchovies, and 0.278 in sprats) and never reach the lower limit of levels (4.74 ppm) capable of causing deleterious effects to reproduction in trout. Though trout is not of the same species, the resulting effect is indicative of that on reproductive capacity in general.

75-1562. Yamada, T.; Sakamoto, Y. (Hiroshima Pref. Inst. Prevent. Environ. Pollut., Hiroshima, Japan). [**Results of survey of pesticide residues in mother's milk and soil.**] *Hiroshima-Ken Eisei Kenkyusho Fuzoku Kogai Kenkyusho Gyomu Nenpo (Hiroshima Pref. Inst. Prevent. Environ. Pollut. Annu. Rep.)* 3: 57-58; 1973. (1 reference) (Japanese)

Milk specimens were collected from 10 lactating mothers more than 1 month after delivery and representative organochlorine pesticide residues were determined in the specimens. The minimum, maximum, and average (in parentheses) contents of α-, β-, γ-, and δ-BHC, *p,p'*-DDT, and *p,p'*-DDE in ppm were respectively 0 — 0.002 (< 0.001), 0.021 — 0.045 (0.033), 0 — 0.10 (0.006), 0 — 0.001 (< 0.001), 0.006 — 0.039 (0.018) and 0.010 — 0.029 (0.021). No residue was found of *p,p'*-DDT, polychlorocyclodienes, or heptachlor epoxide. These levels were considerably lower than in 1972. The residues were considerably lower than the Ministry's standard for cow's milk. The BHC residues in 21 specimens of soil in which vegetables had been grown were determined; the maximum, minimum, and average (in parentheses) contents of α-, β-, γ-, and δ-BHC were 0.010 — 0 (0.001), 0.014 — 0 (0.005), 0.003 — (<0.001) and 0.001 — 0 (<0.001), respectively. DDT and organophosphorus pesticide residues could not be detected. Generally the residue values were smaller than in 1972.

75-1563. Golab, T.; Bishop, C. E.; Donoho, A. L.; Manthey, J. A.; Zornes, L. L. (Lilly Res. Lab., Div. Eli Lilly Co., Greenfield, IN 46140). **Behavior of ^{14}C oryzalin in soil and plants.** *Pestic. Biochem. Physiol.* 5(2): 196-204; 1975. (9 references)

Radiochemical studies of field soil treated with ^{14}C oryzalin indicated that the compound is readily degradable. One year after soil treatment, 45% of the original radioactivity had dissipated. Of the remaining amount, 25% was extractable and 30% was "soil bound". The extractable fraction contained oryzalin and several degradation products, some of which were isolated and identified. No single degradation product accounted for more than 3% of the applied oryzalin. The "soil-bound" radioactivity was extractable with hot alkali. The total radioactivity decreased at a slower rate during the 2nd and 3rd years after treatment. After 36 months, the O-6 in soil layer contained 38% of the applied radioactivity. No significant radioactive residues were detectable in either seed or forage of soybean and wheat plants. No specific metabolites of oryzalin were identified in soybean plants. Trace amounts of radioactivity found in plant tissue appeared to be associated with the various plant constituents.

75-1564. Smelt, J. H.; Leistra, M. (Laboratory for Research on Insecticides, Wageningen, The Netherlands). **Conversion of metham-sodium to methyl isothiocyanate and basic data on the behavior of methyl isothiocyanate in soil.** *Pestic. Sci.* 5(4): 401-407; 1974. (13 references)

Data were collected that are needed to simulate soil fumigation with metham-sodium with computation models. The rate of conversion of metham-sodium into methyl isothiocyanate was dependent on temperature and soil type, and conversion was usually completed within a few hours. In comparison with dichloropropene, there was a higher water/gas distribution ratio and thus a slower vapor diffusion. Adsorption from the water phase onto the solid phase was weaker. The first-order rate equation described the decomposition of methyl isothiocyanate and the half-lives varied from a few days to a few weeks according to temperature and soil type. (Author abstract by permission)

75-1565. Leistra, M.; Smelt, J. H.; Nollen, H. M. (Lab. Res. Insecticides, Wageningen, The Netherlands). **Concentration-time relationships for methyl isothiocyanate in soil after injection of metham-sodium.** *Pestic. Sci.* 5(4): 409-417; 1974. (6 references)

Soil fumigation with metham-sodium in the field was studied in detail by characterizing soil and climatic conditions, and by measuring concentrations of methyl isothiocyanate. The effectiveness of two dosages in two contrasting soil profiles was compared on the basis of computed concentration-time products for methyl isothiocyanate in the water phase. Under wet conditions, the vapor diffusion of methyl isothiocyanate was very slow and resulted in an irregular distribution in the soil. Showers further decreased effectiveness in the upper part of the soil. A dried top layer was unfavorable for the concentration-time product near to the surface. Diffusion of methyl isothiocyanate to depths greater than about 30 cm was very slow. (Author abstract by permission)

75-1566. Beynon, K. I.; Roberts, T. R.; Wright, A. N. (Shell Research Ltd., Sittingbourne, Kent, England). **The degradation of the herbicide benzoylprop-ethyl following its application to wheat.** *Pestic. Sci.* 5(4): 429-442; 1974. (9 references)

The herbicide benzoylprop - ethyl [Suffix, ethyl (±) - 2 - (*N* - benzoyl - *N* - 3,4 - dichloroanilino)propionate] has been applied in a radiolabeled form to spring wheat and winter wheat growing both indoors and outdoors. During the application the compound also fell onto the soil. The plants and corresponding soils were examined at harvest at 71-98 days from treatment. Conversion of the herbicide occurred in plants and soil predominantly by a hydrolytic reaction to form benzoylprop followed in plants by its conjugation with sugars. Small amounts of *N* - benzoyl - 3,4 - dichloroaniline and benzoic acid were also detected in plants. There was no evidence for the presence of 3,4-dichloroaniline in the crops or soils nor was there evidence for 3,4,3',4'-tetrachloroazobenzene which has been implicated as a degradation product of some 3,4-dichloroaniline herbicides in soils. Residues on plants were greatest in the straw and consisted mainly of benzoylprop-ethyl and benzoylprop in free and conjugated forms. There was no evidence for appreciable movement of the compound within the plant from the treated foliage. Residues were particularly low in the grain and were not detected in the crop grown outdoors (limit of detectability 0.01 mg/kg). Residues in the soils were mainly in the 0-7.5 cm layer and

there was no evidence for leaching below 15 cm. (Author abstract by permission)

75-1567. Beynon, K. I.; Roberts, T. R.; Wright, A. N. (Shell Research Ltd., Woodstock Lab., Sittingbourne, Kent, England). **Degradation of the herbicide benzoylprop-ethyl in soil.** *Pestic. Sci.* 5(4): 451-463; 1974. (10 references)

The degradation of [^{14}C]benzoylprop ethyl (Suffix, ethyl *N* - benzoyl - *N* - (3,4 - dichlorophenyl) - 2 - aminoprop ionate) in four soils has been studied under laboratory conditions. The major degradation product of benzoylprop ethyl at up to 4 months after treatment was its corresponding carboxylic acid. On further storage this compound became firmly bound to soil before it underwent a slow debenzoylation process which led to the formation of a number of products including *N* - 3,4 - dichlorophenylalanine, benzoic acid, 3,4-dichloroaniline (DCA), which was mainly present complexed with humic acids, and other polar products. Although these polar products were not identified, they were probably degradation products of DCA, since they were also formed when DCA was added to soil. No 3,3′,4,4′ - tetrachloroazobenzene (TCAB) was detected in any of the soils at limits of detectability ranging from 0.01-0.001 ppm. Since *N*-3,4 - dichlorophenylalanine and 3,4 - dichloroaniline were transient degradation products of benzoylprop ethyl, the metabolism in soil of radio-labeled samples of these compounds was also studied. In these laboratory experiments the persistence of the herbicide increased as the organic matter content of the soil increased and the time for depletion of half of the applied benzoylprop ethyl varied from 1 week in sandy loam and clay loam soils to 12 weeks in peat soil. (Author abstract by permission)

75-1568. Ismail, M. A.; Wardowski, W. F. (Florida Dep. Citrus, Lake Alfred, FL). **Reducing sodium *o*-phenylphenate level in simulated packinghouse effluent with activated carbon.** *Proc. Fla. State Hortic. Soc.* 87: 243-245; 1974. (5 references)

The efficiency of granular activated carbon in removing sodium *o*-phenylphenate from simulated packinghouse effluents was investigated in laboratory tests. Aqueous solutions of 100 ppm fungicide ranging in vol between 15 and 150 gal were passed at 2 gal/min through a filtration purification unit packed with 3 lb granular activated carbon. Discharged effluent was sampled at 5 gal intervals and the samples analyzed for phenolic content with 4-aminoantipyrine and potassium ferricyanide. Of the 418.7 g sodium *o*-phenylphenate passed through the filtration unit, 203.99 g was retained on activated carbon. Overall retention by 1362 g activated carbon was 51% of the fungicide contained in 1100 gal 100 ppm solution. Removal percentage declined gradually as the volume introduced was increased. Removal efficiency gradually declined from an initial high of 81.5% to 27.5% after 1100 gal had passed through the purification system.

75-1569. Hinojo, J. M.; de Ramallo, N. E. V. (Dep. Cana Azucar, Estac. Exp. Agric. Tucuman, Tucuman, Argentina). **Contaminacion de aguas de riego con herbicidas hormonales. [Contamination of irrigation water with hormonal herbicides.]** *Rev. Ind. Agric. Tucuman* 49(2): 1-8; 1972. (5 references) (Spanish)

Samples of irrigation water, which was used as a vehicle for treatment of tomatoes and peppers with fungicides and insecticides were taker from an area where sugar cane and vegetables were grown to demonstrate its possible contamination with hormonal herbicides. Tomato plants (*Lycopersicon esculentum*) var. Plantense, which were grown under greenhouse conditions, were sprayed with samples of water containing 0.01, 0.05, and 0.1 ppm of 2,4-dichlorophenoxyacetic acid (2,4-D) in a total of six applications at intervals of 5 days. The plant height, as well as the comparison of fresh and dry weights, permit the evaluation of the degree of contamination with respect to an untreated control. It is concluded that there is a cumulative effect of 2,4-D type hormonal substances on repeated applications of water containing the compound. Water samples bioassayed contained 0.01-0.05 ppm of 2,4-D.

75-1570. Cossio, R. P. (Dep. Cana Azucar, Estac. Exp. Agric. Tucuman, Tucuman, Argentina). **Contenido de arsenico en jugo y bagaze de cana de azucar tratada con compuestas organicos arsenicales. [Arsenic content in sap and pulp of sugarcane juice treated with arsenic containing herbicides.]** *Rev. Ind. Agric. Tucuman* 49(2): 51-57; 1972. (7 references) (Spanish)

Experiments were conducted to determine the degree of toxicity of arsenical herbicides related to the content of arsenic in the sap and pulp of sugarcane. The application of such herbicides increases the arsenic content to levels greater than that set by FAO/WHO standards (0.05 ppm or less in sap, and 0.14 ppm or less in pulp). After the application of herbicides at 5.2 kg/ha, the arsenic content of sap varies from 0.085 to 0.032 ppm and in pulp from 0.165 to 0.120 over five months. Application of 3.0 kg/ha produces an arsenic content of 0.040 to 0.030 ppm in sap and 0.145 to 0.132 ppm over a two month period. It is concluded that such herbicides should not be applied less than five months before the crop is harvested.

75-1571. Pavlou, S. P.; Clayton, J. R., Jr.; Inman, D. L. (Dept. of Oceanography, Univ. Washington, Seattle, WA 98195). **Pollution in coastal waters.** *Science* 184(4139): 914-915; 1974. (6 references)

The unit of 10 to the -8th power of DDT and DDE/cu m of surface water selected by Inman and Brush to demonstrate the concentration gradient is termed inappropriate in a Letter-to-the-Editor. The value is criticized because it does not account for spatial variations in zooplankton biomass. Concentration data should always be normalized to biomass-related parameters when assessing the biological consequences of various toxic pollutants in the marine environment. In a reply to this criticism, D. L. Inman defends his figures. They were used to illustrate the fact that wind and wave induced surface currents tend to produce circulation patterns that favor the retention of particulate material near the coast, whereas biological

scavenging and absorption by suspended particles concentrate dissolved pollutants in coastal waters.

75-1572. Johnston, D. W. (Dep. Zool., Univ. Florida, Gainesville, FL 32611). **Decline of DDT residues in migratory songbirds.** *Science* 186(4166): 841-842; 1974. (26 references)

In the ten species of 169 individuals analyzed no sample was devoid of DDT and its metabolites. Total DDT levels in most species had decreased to less than 5 ppm. Thirteen of 43 samples examined for dieldrin gave negative results; the maximum dieldrin level noted was 1.50 ppm. (Author abstract by permission, supplemented)

75-1573. Otsuki, K.; Sekita, H.; Takeda, M.; Tanabe, H. (Nat. Inst. Hyg. Sci., Setagaya-ku, Tokyo, Japan). [**Studies on analysis of pesticide residues. VI. Organochlorine pesticide residues in imported meat.**] *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 13(4): 338; 1972. (6 references) (Japanese)

Imported beef, chicken, horse, mutton, lamb, and rabbit meats were examined for residues of BHC, DDT, DDE, DDD, and dieldrin. Each meat was separated into muscle and fat parts, and pesticide residue analyses were made for each part. Sample meat is ground and mixed with distilled water, then extracted with *n*-hexane. Both qualitative and quantitative determinations were made by a gas chromatograph equipped with an EC detector (Ni 63) using standard pesticides. The results are compared with available data for domestic meats. No β-BHC was detected in beef imported from the US and Australia; however, γ-BHC lindane was found, and at higher levels in fat than in muscle for both types of beef. The total BHC content in beef muscle from the the US and Australia was 0.003 ppm, which was much lower than that in domestic beef. The total amount of *p,p'*-DDT, plus *p,p'*-DDD (TDE), and *p,p'*-DDE was 0.013 ppm and 0.020 ppm in beef muscle from Australia and the US, respectively, and these levels are nearly comparable to those for domestic beef. The content of *p,p'*-DDT found in all meats ranged between 57 and 100% of the total DDT content, which was 30 to 83% of total organochlorine pesticide residues detected. The dieldrin content was between 1 and 20% of the total pesticide residues. The BHC content in all imported meats was generally less than that found in domestic meats. The total organic pesticide residue found in all imported meats tended to be smaller than that of domestic meats.

75-1574. Morita, M.; Ushio, F.; Nishizawa, T.; Fukano, S.; Doguchi, M.; Mimura, S. (Tokyo Metrop. Res. Lab. Pub. Health, Tokyo, Japan). [**Hexachlorobenzene in foods.**] *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 16(1): 53-54; 1975. (4 references) (Japanese)

The fungicide hexachlorobenzene is not registered as a pesticide in Japan, but is used as a rubber additive. It was recently found by the authors that a wide variety of foods were polluted by this compound; for instance, beef contained 12 ppb, pork 7, chicken 4, pike 11, salmon 9, carp 8, and butter 4 ppb of hexachlorobenzene. Human fat was by far the most heavily polluted, with 210 ppb. These data were obtained by GLC on a column with bentonite 34 (5%) plus DC200 (5%) on Chromosorb W-AW-DCMS (60/80) at a temperature of 180°C, using 60 ml/min of nitrogen as carrier gas.

75-1575. Saltzman, S. (Volcani Cent., Agric. Res. Org., Bet Dagan, Israel). **The surface catalyzed hydrolysis of parathion on kaolinite.** *Soil Sci. Soc. Am. Proc.* 38(2): 231-234; 1974. (13 references)

The decomposition of parathion on various monoionic kaolinites was investigated. The degradation was found to proceed via the hydrolysis of the phosphate ester to *p*-nitrophenol and diethyl thiophosphate. The kaolinites were found to catalyze the hydrolysis. The nature of the exchangeable cation greatly affected the rate of hydrolysis. Ca-kaolinite was the most active in inducing the degradation of parathion, the hydrolysis being twice as fast as in a water solution at pH 8.5 at the same temperature. The presence of a large excess of water decreased the catalytic effect of the kaolinite. The mechanism of the hydrolysis is via adsorption of the parathion upon the exchangeable cation or its hydration shell. The temperature dependence of the process is consistent with this proposed mechanism. The significant catalytic activity of kaolinites and its dependence on the exchangeable cation is important to the understanding of the degradation of parathion in soil and may be utilized in the formulation of parathion for various purposes. (Author abstract by permission)

75-1576. Acker, L.; Fincke, A.; Schulte, E. (Inst. Lebensmittelchem., Univ. Muenster, Germany). **Entfernung chlorierter Insektizide aus Kakaobutter durch Desodorieren.** [**Removal of chlorinated insecticides from cacao butter by deodorizing.**] *Suesswaren* 16(6): 245-247; 1972. (3 references) (German)

The efficiency of steam distillation, commonly used for the deodorization of fats and oils in removing DDT, DDE, and lindane from cocoa butter to which they had been added in concentrations of 1, 3, and 10 ppm was studied under laboratory conditions. Deodorization at 164°C, 8 mm Hg, 1.5 hr, and a steam throughput of 10% relative to the fat content was not sufficient for removing the residues, especially of DDT and DDE. Temperatures of 220-230°C, a vacuum of 3 monthly, a steam throughput of 20%, and a treatment time of 3 hr resulted in a reduction of the lindane, DDT, and DDE residues to 0.1%, 6%, and 2%, respectively. Practically residue-free cocoa butter was obtained by doubling the steam throughput.

75-1577. Tsuchiya, Y.; Kowase, T.; Yamazaki, K.; Matsumoto, K.; Mimura, S. (Dep. Environ. Health, Tokyo Metrop. Res. Lab. Pub. Health, Tokyo, Japan). [**Polychlorinated biphenyl levels in the sediments of Tokyo Bay.**] *Tokyo-Toritsu Eisei Kenkyusho Kenkyu Nenpo (Annu. Rep. Tokyo Metrop. Res. Lab. Pub. Health)* 24 : 371-381; 1973. (7 references) (Japanese)

The extensive use of PCBs in paints, varnishes, waxes, and synthetic polymers led to direct environmental

contamination through industrial waste water and sanitary discharge. The physical properties and residues of PCBs in fish clearly indicate that these materials become markedly concentrated (about one hundred times) during their progress through the food chain. Since the detection of PCB contamination is an urgent problem, a report is presented on the determination of PCBs and DDT and its metabolites (DDE) in samples of Tokyo Bay sediment collected at 47 stations over the period from October 1971 to February 1972. All samples were identified and measured by electron capture gas chromatography. PCBs and the sum of DDT and DDE (T-DDT) were determined for all samples. Residue levels were as follows — Tokyo area: PCBs 0.02-2.0 ppm and T-DDT 0.001-0.059 ppm; Kanagawa area: PCB 0.02-0.39 ppm and T-DDT 0.001-0.031 ppm; Chiba area: PCB Tr-0.10 ppm, and T-DDT Tr-0.004 ppm. Concentrations of PCBs were markedly higher than the sum of DDT and DDE in all sediments analyzed. Contamination by PCBs and DDT and its metabolites (DDE) was found to be significantly higher in coastal areas, especially in stations off large cities and industrial regions. Also, all samples contained Kanechlor 600, which seems to come from ship paint.

75-1578. Amamiya, T.; Ito, K.; Yamazoe, R.; Harada, H.; Totani, T. (Sect. Micro-Anal. Res., Div. Physical-Chem., Tokyo Metrop. Res. Lab., Tokyo, Japan). [**Hygienic chemical studies on harmful elements. Part 5. Contents of heavy metals in vegetables and fruits.**] *Tokyo-Toritsu Eisei Kenkyusho Nenpo (Annu. Rep. Tokyo Metrop. Res. Lab. Pub. Health)* 25: 127-132; 1974. (18 references) (Japanese)

In addition to their natural intake as necessary elements for plant growth, some heavy metals have been artifically applied as components of agricultural chemicals and remained in/on the vegetables and fruits. About 270 specimens of vegetables and fruits were analyzed for Cd, Pb, As, Cu, Zn, and Mn for 3 years beginning in 1971. Data was given for Pb, Cu, Zn, As, and Mn, which are contained in registered pesticides. The lead content showed relatively high values in spinach, apple, and peel of summer orange, respectively 0.133, 0.139 and 0.166 ppm. The arsenic content was relatively high in peel and pulp of summer orange and strawberry, respectively 0.048, 0.030 and 0.020 ppm. That of copper was relatively high in potato, spinach and tea leaf, respectively 1.015, 0.70, and 5.960 ppm. That of zinc was 5.578, 2.410, 2.100 and 32.88 ppm, respectively in spinach, cucumber, potato, and tea leaf. That of manganese was 5.249 (0.770 — 13.16) and 5.112 (1.547 — 8.354) ppm respectively in spinach and strawberry. In tea leaf the manganese content was 1112 ppm (800 — 1980). It was noticed that the contents of heavy metals in vegetables and fruits showed a decreasing tendency year after year.

75-1579. Mestres, R.; Illes, S.; Espinoza, C.; Chevallier, C. (Laboratoire de Chimie appliquee a l'expertise, Faculte de Pharmacie de Montpellier, Montpellier, France). **Recherche et dosage de residus de pesticides dans le tabacs.** [**Pesticide residues in tobacco.**] *Trav. Soc. Pharm. Montpellier* 34(3): 255-266; 1974. (11 references) (French)

Fifty different cigarette and tobacco samples from different countries (Albania, Austria, Belgium, Bulgaria, China, Japan, Romania, Thailand, Yugloslovia, Switzerland, Denmark, France, Italy, The Netherlands, The US, Belgium, Luxembourg, and West Germany), as well as their smokes were investigated for pesticide residues by thin-layer chromatographic method. Residues of α-BHC, lindane, DDE, DDD (TDE), DDT, parathion, and malathion were detected in tobacco. These residues were present in 36.8%, 36.8%, 75.6%, 83.6%, 98%, 48.8%, and 12.2% of all samples. The average residue levels in the positive samples were 0.054 mg/kg for α-BHC, 0.078 mg/kg for lindane, 0.186 mg/kg for DDE, 0.69 mg/kg for DDD, 0.937 mg/kg for DDT, 0.036 mg/kg for malathion, and 0.04 mg/kg for parathion. The pesticide residues found in the tobacco were also present in the smoke; part of the residue from smoke is retained in the bronchi of both smokers and non-smokers.

75-1580. Mestres, R.; Illes, S.; Chevallier, C.; Levy, A.; Fichback, E. (Lab. Chim. Appliq. Expert., Fac. Pharm. Montpellier, Montpellier, France). **Residus de pesticides organohalogenes dans les matieres grasses humaines.** [**Halogenated organic pesticide residues in human fat.**] *Trav. Soc. Pharm. Montpellier* 34(3): 267-274; 1974. (4 references) (French)

The aldrin, dieldrin, DDE, and DDT residue levels were studied in superficial and deep fat samples from healthy subjects and cancer patients (12 males, 29 females). The mean values of dieldrin contents were between 0.20 and 0.37 mg/kg in superficial and deep fat, while the total DDE+DDT content had a mean value of 3.43-4.55 mg/kg in superficial fat, and 4.0-6.5 mg/kg in deep fat. The aldrin levels in the fat, as well as organochlorine pesticide levels in the blood, were very low, and the latter did not correlate with the residue levels in fat. No significant differences were found in the residue levels between healthy individuals and cancer patients, and between smokers and non-smokers. The residue levels were higher in males than in females, which may be due to the higher fat content in the female.

75-1581. Konnai, M.; Takeuchi, Y.; Takematsu, T. (Utsunomiya Univ., Utsunomiya, Japan). [**Fundamental studies on residues and movement of forestry herbicides in soil.**] *Utsonomiya Daigaku Nogakubu Gakujutsu Hokoku (Bull. Coll. Agric. Utsonomiya Univ.)* 9(1): 95-112; 1974. (4 references) (Japanese)

Experimental results (covering the period 1969-1972) regarding the behavior in the soil of some major herbicides used in forested areas are presented. Movement was greater with inorganic compounds whose basic structures are charged negatively (ClO_3-, NH_2SO_3-), while the degree of translocation in the soil varied according to factors such as soil type, humus, amount and intensity of rainfall, and inclination of land. Chlorate, sulfamate, and fatty acid type herbicides showed greater

movement then phenoxy and benzoic acid type herbicides. Esterified compounds revealed much less movement and were firmly adsorbed on the soil surface. Herbicides of high water solubility with negative charges closely correlated with the movement of soil water. Six compounds tested with regard to residues were inactivated completely after 4 to 14 weeks when applied at standard dosage. Inactivation tended to be rapid with DPA (2,2-dichloropropionic acid) and slow with TFP (2,2,3,3-tetrafluoropropionic acid) and AMS (ammonia sulfamate). The term of residue persistence was prolonged as the dosages increased, espcially with TFP, TBA (2,3,6-trichlorobenzoic acid), and 2,4,5-T (2,4,5-trichlorophenoxyacetic acid). The length of residue persistence tended to become shorter as microorganisms proliferated. Experiments were carried out by means of bioassays using plant seeds which are sensitive to weed-killers and were conducted in the laboratory and in fields and forest lands.

75-1582. Breyl, I.; Kredl, F. (State Vet. Inst., Jihlava, Czechoslovakia). **Chlorovane pesticidy v potravinach zivocisneho puvodu.** [**Chlorinated pesticides in foodstuffs of animal origin.**] *Vet. Med. (Prague)* 19(2-3): 121-126; 1974. (5 references) (Czech)

Chlorinated pesticide residues (lindane, DDT, DDE, endrin) in foodstuffs of animal origin (cheese, ham, fatty tissue of pigs, dried eggs) were studied using gas chromatography with electron capture detector. Examination of the fatty tissues was performed according to a two-step method based on acetonitrile extraction with subsequent cleanup on a Florisil column. Chlorinated pesticide residues were found in all the samples tested. The highest quantities of residues were found in the pig fat (lindane 0.109 mg/kg, DDEDT 1.33 mg/kg, on the average). In other samples the residue levels were lower. Some samples of dried eggs contained high levels of residues (DDEDT as much as 2.5 mg/kg). Tests revealed no endrin in any of the samples.

75-1583. Kramer, A.; Ferwerda, J. D. (Keuringsdienst Waren, Keuringsgebied 's-Hertogenbosch, The Netherlands). **Bestrijdingsmiddelen in thee.** [**Pesticides in tea.**] *Voeding* 33(12): 575-576; 1972. (Dutch)

Results of pesticide residue analyses in 55 tea samples of different origins are presented. While 16 samples contained less than 0.065 ppm DDT, the DDT levels were between 0.065 and 0.13 ppm in 10 samples, between 0.13 and 0.17 ppm in 12 samples, between 0.27 and 0.54 ppm in 13 samples, between 0.54 and 1 ppm in 2 samples, and 1.13 ppm and 2.46 ppm in 1 sample each. The tea was found to contain 0.01 ppm DDT when infused from tea leaves containing 2 ppm DDT. Traces of dieldrin, as well as thion were found in two samples. Metabolites of DDT, such as *p,p'*-DDT and *o,p'*-DDT, as well as traces of DDE and TDE were also detected. Both DDT and dieldrin are used in tea plantations in a decreasing amount.

75-1584. Verschuuren, H. G. (Rijksinstituut voor de Volksgezondheid, De Built, The Netherlands). **Residuproblemen bj groente en fruit.** [**Residue problems in vegetables and fruits.**] *Voedingsmiddelentechnologie* 4(48): 179; 1973. (Dutch)

Residue problems in vegetables and fruits are discussed with respect to recent residue standards issued in the member countries of the European Common Market. The acceptable daily intake is determined with respect to the no-effect level of the pesticides involved and of the average daily consumption, and it serves as a basis for calculating the maximum allowable residue concentrations in fruits and vegetables. Random samples of produce are analyzed for pesticide residue levels, and if the latter are higher than the standard tolerance, an additional waiting time is imposed with respect to the time elapsed between sampling and analysis.

75-1585. Heinisch, E. (Inst. Pflanzenschutzforsch. Akad. Landwirtschaftswissensch. DDR, Berlin, DDR). **Zur Kontamination des Bodens mit Agrochemikalien und den hieraus entstehenden Nebenwirkungen.** [**Contamination of soil with agricultural chemicals and resulting side effects.**] *Wiss. Z. Tech. Univ. Dresden* 22(4): 670-674; 1973. (23 references) (German)

Studies on the persistence in and translocation from soil of DDT, lindane, toxaphene, polychloropinene, dicofol, and *s*-triazines are presented along with recommendations to abate food contamination in plants grown in contaminated soil. Examination of soil samples for DDT residues revealed relatively high incidence of DDT in fairly high concentrations. In addition, DDT was taken up readily by plants, as a function of the type of soil and of the lipophilic substances in the plants. Soil contamination with lindane, intended for use in place of DDT, was much less serious, and the lindane levels in plants were rather low. Toxaphene and polychloropinene were found to be persistent in soil and to be taken up readily by plants. Simazine and atrazine were more persistent than desmetryne and prometryne. Organomercurial fungicides do not substantially influence the mercury levels in plants.

75-1586. Weil, L.; Dure, G.; Quentin, K.-E. (Inst. Wasserchem. Chem. Balneol., Tech. Univ. Munich, Munich, Germany). **Wasserloeslichkeit von insektiziden chlorerten Kohlenwasserstoffen und polychlorierten Biphenylen im Hihblick auf eine Gewaesserbelastung mit diesen Stoffen.** [**Water-solubility of organochlorine pesticides and PCBs with respect to water contamination with these compounds.**] *Z. Wasser-Abwasser-Forsch.* 7(6): 169-175; 1974. (17 references) (German)

A reproducible method for the determination of the solubility of organochlorine pesticides and PCBs in water is described. Using acetone as a solvent, a known quantity of the substance to be investigated is applied on Mg-silica gel (Florisil). The solvent is evaporated, and the organochlorine substance is eluted with distilled water. Using this method the solubility of aldrin was determined

to be 17 μg/liter, while 1,850 μg/ml was obtained chlordane, 9 μg/l for Clophene A 60, 20 μg/l for *p,p'*-DDD, 14 μg/l for *p,p'*-DDE, 5.5 μg/l for DDT, 26 μg/l for *o,p'*-DDT, 200 μg/l for dieldrin, 260 μg/l for endrin, 5 μg/l for BHC, 2,000 μg/l for α-BHC, 240 μg/l for β-BHC, 7,800 μg/l for lindane, 350 μg/l for heptachlor epoxide, 1,320 μg/l for kelthane, 100 μg/l for methoxychlor, 740 μg/l for toxaphene as well as ranging from 0.016 to 4,130 μg/l for 28 different PCB isomers. The variation between different test series was not higher than 10%.

See also **75-1594** **75-1604** **75-1642** **75-1661** **75-1732** **75-1758** **75-1771**

75-1587. Dixon, R. L. (Environ. Toxicol. Branch, Natl. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **Toxicology of environmental agents: a blend of applied and basic research.** *Am. J. Pharm. Educ.* 38(3): 348-353; 1974. (2 references)

It is essential to develop more reliable, faster, and more economical test procedures to assess the hazards of environmental chemicals to human health. Safety evaluation should be the ultimate goal of all toxicologists. The toxicologic study of any chemical involves various scientific disciplines and affects the environment in the areas of pollution, residues, and industrial hygiene; the economic picture in the areas of food additives, pesticides, and insecticides; and the forensic sciences in the areas of diagnosis, therapy, and medicolegal aspects. Environmental toxicology is primarily concerned with the biological effects in man of chemicals which are incidentally encountered in the atmosphere, by contact during occupational or recreational activities, or by ingestion of food additives. Real and potential hazards are difficult to define. Acute toxicity is less a concern than are long term risks such as carcinogenesis and mutagenesis. The lack of appreciation for the over-all problem has produced too little solid information and too much data from experiments inadequately designed to yield the maximum benefit.

75-1588. McLean, R. G.; Spillane, J. T.; Miles, M. W. (Cent. Disease Contr. Bur. Trop. Diseases, Atlanta, GA 30333). **A prospective study of the effects of ultralow volume (ULV) aerial application of malathion on epidemic *Plasmodium falciparum* malaria. III. Ecologic aspects.** *Am. J. Trop. Med. Hyg.* 24(2): 193-198; 1975. (23 references)

The effects of aerial ultralow volume (ULV) malathion on selected species of nontarget animals in Haiti are reported. Dosage rates were 6 oz/acre for the first treatment cycle and 4.5 oz/acre for all subsequent cycles. Mortalities of certain groups of insects such as bees, flies, beetles, and butterflies were observed immediately following spray application. Minor fish mortality occurred only in shallow water exposed to direct spray. The brain acetylcholinesterase levels of living fish, tree lizards, birds, and bats collected from treated areas were not significantly reduced. No ill or dead animals aside from the few fish were seen when maximum exposure occurred. The only significant change in birds was delayed foraging (by 1 hr) by swallows, and fewer birds were seen feeding over Savanne Ouest. The relative bird density decreased substantially for only one species during the study, and other factors besides treatment were considered as reasons for the decline. Aerial application of ULV malathion at dosages sufficient to dramatically reduce anopheline populations did not significantly affect nontarget vertebrates.

75-1589. Baran, R. L. (Cannes, France). **Nail damage caused by weed killers and insecticides.** *Arch. Dermatol.* 110(3): 467; 1974. (3 references)

Nail damage caused by weed killers and insecticides is described and a case study of damage caused by 5% dinitro-orthocresol (DNOC) is reported in a letter to the editor. A 65-year old man handled DNOC concentrate for 3 hr. Damage started after 15 days with a change in nail color; at 2 mo there was slight painless paronychia. At 7 mo edema of proximal nail folds was still present, and a white sebaceous material could be squeezed from the nail. The condition is similar to damage from diquat and paraquat. A 20% solution of diquat can cause nail disturbance within minutes. In a survey of 296 spray operators exposed to diluted paraquat, 55 operators had nail damage ranging from localized discoloration to loss of nail. The index, middle, and ring fingers of the right hand were predominantly affected. Eleven operators also had damage to the toe nails.

75-1590. Davies, J. E. (Dep. Med., Univ. Miami, Miami, FL). **Los plaguicidas y el ambiente. Cambios en el efecto de las plaguicidas sobre la salud del hombre. [Pesticides and the environment. Changes in the effects of pesticides on human health.]** *Bol. Of. Sanit. Panam.* 74(6): 480-490; 1973. (17 references) (Spanish)

Because vital cholinesterase activity is blocked, exposure to common organophosphate insecticides such as parathion can rapidly prove fatal. Usually respiratory failure stemming from muscle paralysis or bronchiolar constriction is the immediate cause of death. Important elements of treatment are airway restoration and hypoxia correction, atropine and oxime therapy, decontamination, and investigation of the place where the poisoning occurred. Extreme caution is needed to minimize the exposure of workers and others where organophosphates are used, and workers must be monitored for signs of undue exposure. Suggested preventive measures include proper training of workers, the use of protective clothing, and a regular program for examining the levels of urine residues and blood cholinesterase. In contrast, studies of DDT have revealed no serious human toxicity problems. Organochlorines have been decried because of patterns of insect resistance and potential adverse effects on some fish and birds. Small international teams organized to assure the safe use of pesticides could contribute greatly to DDT residue surveillance and to the prevention of organophosphate poisoning in man.

75-1591. Calnan, M. (Natl. Children's Hosp., London, E.C.1, England). **Poisoned children.** *Br. Med. J.* 3(5934): 802; 1974.

The findings of a study of accidental child poisoning in Bristol, England are discussed in a letter to the editor. In at least 65% of 183 episodes of suspected poisoning in which the child had been taken to the hospital, the child had taken either a substance which was innocuous or an innocuous dose of a potentially toxic substance. Forty-four percent were admitted for one night or more but only 28% of the children were evaluated as representing true poisoning cases. The severest injuries were caused by ingestion of domestic substances such as caustic soda and paraffin. The only measure that has a significant effect on the poisoning rate is the child-resistant closure.

75-1592. Maynard, T. J. (Murphy Chem. Co., England). **Safety with chemicals.** *Br. Sugar Beet Rev.* 43(1): 66, 69; 1975.

The application of Temik (aldicarb) in the sugar beet industry and necessary safety precautions are discussed. Aldicarb is a Part II substance (according to Poisonous Subtances regulations) and is a systemic nemticide and insecticide approved for the control of nematodes, saphid, pygmy beetles, leaf miners, and millipedes. Formulation of aldicarb as a 10% granular product makes it considerably safer to handle. The regulations state that full protective clothing must be worn by anyone handling the granules: boiler suit, rubber boots, rubber gauntlet gloves, and a dust mask. If there is a spillage, the operator should wash any dust from the skin or eyes immediately. He should also wash his hands and any exposed skin before eating, drinking, or smoking, and after work. Any heavily contaminated clothing should be removed immediately, and all protective clothing should be thoroughly washed, especially the insides of gloves, after work. Care should be taken to dispose of empty containers either by burying or by burning.

75-1593. Taschenberg, E. F.; Bourke, J. B.; Minnick, D. F. (New York State Agric. Exp. Stn., Geneva, NY 14456). **An air filter-pressurization unit to protect the tractor operator applying pesticides.** *Bull. Environ. Contam. Toxicol.* 13(3): 263-268; 1975. (3 references)

The effectiveness of an air filter-pressurization unit designed to protect the tractor operator applying pesticides was tested. The filters and fan are enclosed in a metal casing protected by a mesh screen and a rubber seal. Three filters are mounted in series: a pre-filter made of fiberglass, an air bag filter, and the chemical absorbing filter containing 40 lb of activated charcoal. The extent to which the air filter pressurization unit removed an insecticide from air entering the tractor cab was determined. Concentrations of methyl demeton in 1 liter samples of filtered air ranged from 0.03 to 0.18 μg/l of air outside the tractor cab. The efficiency of the filtering unit in removal of pesticide is above 99%. When 2.5 μg of methyl demeton was scrubbed from air inside the tractor cab in 1 hr, there were 0.18 μg of the insecticide in 1 liter of air. An operator inhaling 20 l of air/min would inhale about 0.22 μg of the insecticide per hour. This is well below the inhalation LC50 value of 1.5 mg/l for 1 hr.

75-1594. Ter Beek, F.; Bokhorst, R.; Plas, M. V. D.; Olsthoorn, K.; Vergragt, P.; Van Der Zwan, G. (Author address not given). **Dioxine, een gevaarlijke verontreiniging in een veel gebruikt herbicide. [Dioxin, a dangerous contaminant in a much used herbicide.]** *Chem. Weekbl.* 69(23): 5, 7; 1973. (8 references) (Dutch)

Data on the toxicity and persistence of dioxin, a contaminant in the herbicide 2,4,5-T, is presented. Chloracne, headache, lachrymation, anorexia, porphyria cutanea tarda, emotional instability, and reduced libido were found in workers exposed to dioxin in the 2,4,5-T manufacturing process. A significant increase in fetal mortality was determined in mice and rats fed dioxin. The LD50 is 44.7 μg/kg for female rats, 22.5 μg/kg for male rats, and 30-300 μg/kg for dogs. Dioxin exerts a 60 times more powerful effect on zoxazolamine hydroxylase than does benzpyrene. Dioxin is formed at high temperatures during the manufacture of 2,4,5-T, and is generated by pyrolysis at 500-600°C. Dioxin is stable up to 800°C, insoluble in water, and lipophilic. It has slight mobility in soil and is not taken up by plants. Dioxin degraded in the soil at rates of 30-45% in 350 days. Dioxin is photolyzed in alcoholic but not in aqueous solutions. Photolysis results in a harmless metabolite, 2,3,7-trichlorodibenzo-*p*-dioxin.

75-1595. Kay, K. (Mt. Sinai Sch. Med., New York, NY 10029). **Inorganic particles of agricultural origin.** *Environ. Health Perspect.* 9: 193-195; 1974. (19 references)

Speculation is offered regarding the potential health impact of the substantial quantities of inorganic particles disseminated into the environment by agricultural pest control with dry carriers. It is the talc, soapstone, and pyrophyllite, which can contain asbestos in the form of anthophyllite, tremolite, and chrysotile, which hold the potential cancer risk. Approximately 85% of all pesticides are applied by air dissemination, either dry or as a droplet spray. Pulmonary and gastric deposition of the mineral carrier will thus occur widely among pesticide application personnel, as well as among an as yet unknown fraction of the nonoccupationally exposed population in the general area around pest control operations. Ingestion of particulates deposited on food crops may be expected, as well as mineral finding its way into drinking water supplies. Studies have also shown that experimental animals exposed to both fibrous glass and nemalite (fibrous magnesium hydroxide) developed abdominal tumors. Thus, the pulmonary load and perhaps the gastrointestinal load produced by pest control with fibrous but non-asbestos-containing minerals may turn out to be carcinogenic or cocarcinogenic.

75-1596. Bailin, L. J.; Sibert, M. E.; Jonas, L. A.; Bell, A. T. (Lockheed Palo Alto Res. Lab., Palo Alto, CA 94304). **Microwave decomposition of toxic vapor simulants.** *Environ. Sci. Technol.* 9(3): 254-258; 1975. (10 references)

The removal of toxic contaminants or harmful gases from buildings, contained atmospheres, or process exhausts has become an environmental problem. An electrical discharge technique is described whereby the destruction of toxic gas simulants was carried out in a microwave plasma. Nearly 100% decomposition of dimethyl and diisopropyl methylphosphonates in helium and air was effected. Residence times ranged from 0.13-2.4 sec. Identification of reaction products indicates reduction of the compounds in the main to phosphoric acid or its precursor, P_2O_5, and dealkylated phosphonic acids. With modification of the plasma chamber size as exemplified by large plasma applicators, the technique may be utilized for large-scale decomposition of waste insecticides, defoliants, G-agents, and materials not readily amenable to hydrolysis or standard incineration procedures.

75-1597. Goncharuk, Ye. I.; Nayshteyn, S. Ya.; Tsipriyan, V. I. (Kiev Med. Inst., Kiev, USSR). **K metodike normirovaniya vrednykh veshchestv v pochve. [Method of standardizing noxious substances in the soil.]** *Gig. Sanit.* 39(12): 19-23; 1974. (7 references) (Russian)

A method for determining the maximum allowable concentration of pesticide residues in soil is presented. The maximum allowable concentration should be defined as that at which the resulting concentration in plants grown from contaminated soil, in ambient air, and in groundwater does not exceed the respective maximum allowable concentrations in these media. After determining the stability of the pesticide in question in soil, its percolation through the soil is studied in a percolation column to determine the groundwater contamination hazard, after which the release of the pesticide from the soil into the atmosphere is examined in a closed chamber. The migration of pesticide residues from soil into plants is studied in potato and carrot plants grown on this soil. The maximum allowable pesticide residue concentration in the soil is then determined as the lowest of the three limiting values which do not cause air and water pollution or plant contamination above the maximum allowable levels in these respective media.

75-1598. Gaultier, M.; Fournier, E.; Gervais, P.; Efthymiou, M. L.; Frejaville, J. P. (Fac. Lariboisiere-Saint-Louis, Univ. Paris VII, Paris, France). **205 Intoxications aigues accidentelles par les produits industriels, observees en reanimation a l'hopital Fernand-Widal de 1964 a 1973. [Two hundred five accidental acute poisonings by industrial products at the Fernand-Widal Hospital from 1964 to 1973.]** *J. Eur. Toxicol.* 6(6): 263-265; 1973. (French)

Two hundred five cases of accidental, acute poisoning and 178 cases of suicidal acute poisoning by industrial products, observed at the Fernand-Widal Hospital in Paris between 1964 and 1973, are listed. Poisonings with urea-derived herbicides were of moderate severity, while mercury salts, organophosphorous compounds in general, and paraquat in particular were responsible for lethal poisonings at a high rate. Encephalopathy and nephrotic syndromes were observed in poisonings with mercury salts, while organophosphorus compounds caused neuromuscular blockade and lung fibrosis. Organochlorine compounds caused encephalopathy. Arsenic salts, methyl bromide and chloride, DNOC, toluylenediisocyanate, mercury salts, and especially paraquat were among the most toxic compounds encountered.

75-1599. Unz, R. F. (Pennsylvania State Univ., University Park, PA). **Microbiology of waste treatment.** *J. Water Pollut. Control Fed.* 46(6): 1372-1383; 1974. (115 references)

Two studies on the decomposition of pesticides are summarized. A laboratory scale apparatus was developed for the decomposition of soluble compounds such as biodegradable pesticides. An acclimated suspension of microorganisms and the waste stream were passed countercurrent to each other and separated by an ultramembrane filter, which allowed diffusion of pollutants to the microorganisms. Up to 88% decomposition of the herbicide isopropylphenyl carbamate (propham) was achieved with the device. In the second study, degradation of selected herbicides by activated sludge microorganisms followed first order kinetics at low substrate concentrations, changing to zero order kinetics when microorganism-substrate ratios reached 10:1 by weight, possibly reflecting toxicity of the herbicides at the higher concentrations. Decomposition of specific herbicides was influenced by the nature and position of substituent groups on the benzene ring and the nature of the side chain.

75-1600. Anonymous. **Destruktion av kemiavfall—ID-etapp nr 3. [Destruction of chemical wastes: ID stage 3.]** *Kem. Tidskr.* 87(1-2): 78-79; 1975. (Swedish)

The new waste incinerator plant of AB Industridestillation (ID) in Stockholm, designed for the destruction of solid, semi-solid, and pumpable chemical wastes, including DDT and PCB's, is described. Solid chemical wastes are incinerated in shaft furnaces, and fluidized-bed furnaces (turbofluid furnaces) are provided for the incineration of pumpable wastes. The incineration temperature is 1,000-1,200°C in both types of furnaces, and the flue gases are purified in wet scrubbers using lime water.

75-1601. Barbier, F. (Dep. Intern. Med., Akad. Ziekenhuis, State Univ. Ghent, Ghent, Belgium). **Treatment of thallium poisoning.** *Lancet* II(7886): 1528; 1974. (2 references)

The treatment of 11 cases of human thallium poisoning with prussian blue is reported in a Letter-to-the-Editor. The therapeutic effect of prussian blue was dramatic in acute poisoning, but striking improvement occurred even in longstanding intoxications. No side effects were noted on clinical and laboratory grounds, using doses ranging from 88 to 416 mg/kg/day. Duodenal intubation is not necessary for the administration of prussian blue. Fecal elimination was still important when urinary elimination decreased to less than 0.5 mg/24 hr. Continuation of prussian blue administration is recommended for a long time. Constipation must also be treated.

75-1602. Faure, J.; Marka, C.; Faure, H.; Yacoub, M.; Cau, G. (Soc. Med. Leg. Criminol. de France, Paris, France). **Donnees histo-pathologiques et toxicologiques d'une intoxication mortelle par le paraquat. [Histopathological and toxicological data on a fatal case of paraquat poisoning.]** *Med. Leg. Dommage Corpor.* 6: 417-419; 1973. (21 references) (French)

Histopathological and toxicological findings in a case of intentional lethal poisoning with paraquat in a 25-yr-old male are presented. Retention jaundice and anuria were observed. Death due to massive respiratory insufficiency occurred on the 12th day after poisoning. Blood tests on the 4th day revealed 3 mg paraquat per kg in the gastric juice and feces, but none in the blood. Diffuse

pulmonary fibrosis, intrahepatic cholestasis, and acute renal tubular necrosis of toxic type were found on autopsy.

75-1603. Conso, F.; Guillam, C.; Bescol-Liversac, J. (Author address not given). **Intoxication par le dimethyldipyridylium (paraquat). Commentaire des images observees en microscopie electronique. [Dimethyldipyridylium (paraquat) poisoning. Comments concerning electron microscopic aspects.]** *Med. Leg. Dommage Corpor.* 6: 420-422; 1973. (1 reference) (French)

Three cases of severe or fatal poisoning due to accidental ingestion of paraquat are reported, and electron microscopic pictures of the lungs are interpreted. Poisoning showed three distinct phases: one digestive phase with lesions of the mucosa; a renal phase involving predominant epithelial nephritis; and a pulmonary phase with irreversible alterations, including diffuse sclerosis and functional insufficiency. Paraquat, denaturating the lipid acids, exerts a toxic effect on certain membrane formations of sensitive cells, especially renal cells and pneumocytes, and particularly on type II pneumocytes. This effect leads to a deterioration of the cellular and tissue respiration mechanisms, involving a surfactant deficiency. The inflammatory reaction of the alveolar septa is a result of the epithelial alterations. The granulomatous transformation of the septal interstitium leads to progressive sclerosis.

75-1604. Tombergs, H. P. (Bonn-Bad Godesberg, Germany) . **DDT-chlorophenothane: the situation in the Federal Republic of Germany.** ***In:*** *Environmental Quality and Safety, Vol. 2,* F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 24-25.

The regulation of the use of DDT in the Federal Republic of Germany is discussed. A law was enacted that decrees a comprehensive ban on the handling of DDT and DDT formulations as well as a ban on transporting foods of animal origin and certain consumer goods in case the tolerances for whose determination the law contains an enabling authority are exceeded. For foods of vegetable origin, tolerances are already fixed for DDT residues in the Tolerance Regulation for Plant Protection of Nov. 1966. DDT tolerances for animal feeds and drugs are given in the feed law and the drug law, respectively. Although the amounts of DDT in commerce in the Federal Republic of Germany are decreasing year by year (150 tons in 1970), there has been no DDT production for several years. Human fatty tissue currently contains 3.3 ppm and mothers' milk, 3.8 ppm DDT on a fat basis.

75-1605. D'Arca, S. U.; Leoni, V.; D'Alessandro De Luca, E. (Inst. Igiene "G. Sanarelli", Univ. Roma, Rome, Italy). **Su fenomeni di moria di volatili causati dall'uso di pesticidi in agricoltura. [Mortality of birds due to the use of pesticides in agriculture.]** *Nuovi Ann. Ig. Microbiol.* 24: 149-155; 1973. (15 references) (Italian)

Results are presented in connection with the occurrence of two severe mortalities of birds (1971 and 1973) in the vicinity of Rome. BHC, HCB, dieldrin, heptachlor, heptachlor epoxide, DDT, DDE, TDE, parathion, and malathion were identified. The main cause of the mortalities in both cases was parathion, which was found in soil (4.55 ppm), in water (0.4 ppb), and in the carcasses of the birds (20.63 ppm in the stomach). In one case, large quantities of hexachlorobenzene (HBC) were found in the stomach (0.673 ppm) and liver (1.543 ppm) of the birds (1971 figures). It is concluded that under particular environmental conditions some of the organophosphorus pesticides, among these parathion, could have a higher persistence than is usually believed.

75-1606. Biro, K.; Kosa, F. (Szeged Children's Hosp., Szeged, Hungary). **Mergezesek a gyermekkorban. [Poisonings in children.]** *Orv. Hetil.* 115(11): 625-628; 1974. (86 references) (Hungarian)

Poisonings in children are evaluated on the basis of 71 acute poisonings that occurred between 1966 and 1972 in the area of the Szeged Children's Hospital in Hungary. Poisonings due to drugs accounted for 64.8% of the total, and for most of the suicidal cases. Accidental poisonings with household chemicals and related products occurred mostly in small children. One case of moderate severity due to ingestion of a dithiocarbamate was recorded. Highly toxic fungicides and insecticides represent a major poisoning hazard in children.

75-1607. Anonymous. **State certification officials form association in Memphis.** *Pest Contr.* 42(10): 29-30; 1974.

The formation of the State Pest Control Regulatroy Officers Association in Memphis, Tennessee, is discussed. Richard Eldredge, executive director of the National Pest Control Association told officials from 12 states they were ill prepared to implement certification regulations. He recommended the officials form a formal association, read and understand the law, and consider a training program for their states and the type of organization they will construct. Only one state, Pennsylvania, had submitted a certification plan to the Environmental Protection Agency for approval. Most states regulate pesticides through their Departments of Agriculture, which is a questionable way to regulate the structural pest control industry. Reciprocity and a Grandfather Clause were major topics discussed.

75-1608. Miura, H.; Omori, A.; Shibue, M. (Sch. Hyg. Fac. Med., Kumamoto Univ., Kumamoto, Japan). **[The effect of chlorophenols on the excretion of porphyrins in urine.]** *Sangyo Igaku (Jpn. J. Ind. Health)* 16(6): 575; 1974. (1 reference) (Japanese)

Porphyrin was examined in the urine of 25 workers who were engaged in manufacturing pentachlorophenol (11 workers) and 2,4,5-T (14 workers) and began to manifest chloracne and other skin diseases around 1970; these are still present. The average coproporphyrin content of urine was 46.6 ± 36.2 μg/day in the pentachlorophenol (PCP) manufacturing group and 44.8 ± 20.6 μg/day in the 2,4,5-T manufacturing group. Neither of these showed any significant difference from the 32.9 ± 14.8 μg/day of con-

trols. The average urine alanine content was 1.47 ± 0.53 mg/l and 1.60 ± 0.65 mg/l, respectively, showing no significant difference from the 1.27 ± 0.40 mg/l of controls. Urobilinogen was not detected in their urine. These findings indicate that although the possibility that chlorophenols induce porphyria cutanea tarda could not be completely denied the likelihood is small. (Presented at the Kyusho local branch Meeting, June 15, 1974, at Nagasaki, Japan)

75-1609. Thimann, K. V. (Thimann Labs., Div. Nat. Sci., Univ. California, Santa Cruz, CA 95064). **Herbicides in Vietnam.** *Science* 185(4147): 207; 1974.

The findings of the National Academy of Sciences Committee in their report on the Effects of Herbicides in Vietnam are defended in a Letter-to-the-Editor. There was no evidence that birth defects could be attributed to the spraying in the records of the Vietnamese hospitals examined. There was no evidence of the persistence of herbicide residues in the soil of any of the sprayed areas. There was no medical evidence to support claims that any Montagnard children had died from the spraying. The claim that the mangroves in the coastal areas will not regenerate for 100 yr because of herbicides is without foundation. Mangrove swamps have never before been killed by herbicides over large areas.

75-1610. Constable, J. D.; Cook, R. E.; Meselson, M.; Westing, A. H. (Harvard Med. Sch., Massachusetts Gen. Hosp., Boston, MA 02114). **AAAS and NAS herbicide reports.** *Science* 186(4164): 584, 586; 1974. (3 references)

The AAAS and National Academy of Sciences herbicide reports are discussed in a letter to the editor in answer to a letter regarding the military use of herbicides in Vietnam. There is substantial agreement between the findings of the two groups. The AAAS commission made no claim that birth defects or stillbirths result from herbicides, and the commission made no statement regarding herbicide residues in soil. The NAS committee concluded that herbicide residues were generally well below the concentrations harmful to vegetation. Both groups strongly recommended study of the possibility that harmful amounts of the toxic herbicide contaminant dioxin may have entered the diet in some areas. The AAAS committee made no statement on reported deaths of Montagnards, but the NAS Committee said that reports of death and illness caused by herbicides are so consistent that despite the lack of medical and toxicological evidence for such effects they cannot be dismissed and should be investigated. The findings of the two Committees on crop destruction in Vietnam are discussed in relation to the inland forests, bamboo invasion, and mangrove forests.

75-1611. Carter, C. D.; Kimbrough, R. D.; Liddle, J. A.; Cline, R. E.; Zack, Jr., M. M.; Barthel, W. F.; Koehler, R. E.; Phillips, P. E. (Bureau Epidemiol., Cent. Dis. Contr., Atlanta, GA 30333). **Tetrachlorodibenzodioxin: an accidental poisoning episode in horse arenas.** *Science* 188(4189): 738-740; 1975. (11 references)

This report describes the first recognized incident in which significant poisoning resulted from the improper disposal of waste residues containing tetrachlorodibenzodioxin (TCDD). A salvage oil company sprayed an arena on a horse breeding farm in eastern Missouri with waste oil sludge for the purpose of controlling dust. Three days later sparrows and other birds which normally populated the barn rafters were found dead on the arena floor. Hundreds of birds, several cats and dogs, and numerous rodents died over the next several weeks after exposure to the arena. Of the 125 horses on the farm, 85 were exercised for varying periods within the arena and of these, 62 became ill and 48 died. The first horse death occurred on 20 June, and although soil was removed from the arena in October 1971 and April 1972, horses continued to die as late as January 1974. All of those which died had been exposed to the arena in the summer of 1971. Horses showed chronic emaciating weight loss, loss of hair, skin lesions, dependent edema, intestinal colic, dark urine, gross hematuria, conjunctivitis, joint stiffness, and laminitis. In addition to the laminae, the soles and frogs of the horses' feet were particularly inflamed. Similar results occurred after the same company sprayed two additional arenas and a farm dirt road. Human illness, though less severe, included one case of hemorrhagic cystitis in a 6 yr old girl who played in the arena. Analysis of the soil in the arena revealed 2,4,5-trichlorophenol (TCP), TCDD, and related chemicals. Confirmation of the presence of TCDD was obtained by tests in rabbits and by using an LKB 9000 gas chromatograph-mass spectrometer. The horse arena soil contained 31.8 to 33 μg of TCDD/g. As commercial-grade products do not contain such high concentrations of TCDD, an industrial waste by-product of chlorinated aromatic compounds was suspect. The sludge used to spray all 3 arenas came from a common storage tank at the salvage oil company. Salvage oils in this tank had been collected from a variety of sources in eastern Missouri. A hexachlorophene producer in southwestern Missouri contracted disposal of an accumulated distillate residue to a chemical distributor. This distributor subcontracted this disposal job to the salvage oil company which sprayed the three affected arenas. The residue of the hexachlorophene producer had been stored for a time in the same tank from which the sludge had been taken to spray the arenas. This investigation demonstrates that the improper disposal of toxic chemical wastes may have disastrous consequences.

75-1612. Tane, S.; Muromoto, M.; Kouno, E. (Sch. Ophthalmol., St. Marianna Med. Coll, Kawasaki, Kanagawa, Japan). [**Treatment of the ocular disturbance due to splashing of paraquat concentrate into a farmer's eye.**] *St. Marianna Kenkyusho Gyoho (St. Marianna Med. Coll. J.)* 2(3): 78-82; 1974. (9 references) (Japanese)

A 66-year-old farmer while diluting 24% paraquat concentrate, accidentally splashed a large amount of concentrate into his left eye on Aug. 7, 1972. He washed the eye with water, he was treated with eye drops containing steroid and FAD, and injection with lincocin. He was later hospitalized complaining of hyperemia, pain in the eye,

swelling of the eye lid, and disturbed visual acuity. The symptoms on hospitalization were severe pseudomembranous conjunctivitis, superficial keratitis, and corneal erosions. Three weeks were required for recovery of visual acuity; however, no severe sequelae remained except for spotty superficial keratitis. During hospitalization the following findings were obtained by conjunctival biopsy: necrotic ulceration of the epithelial layer, formation of a pseudomembrane, edema, exudation, cellular infiltration, dilatation of capillaries, and hyperemia of the lamina propria, showing inflammatory damage due to toxic and stimulating effects of paraquat.

75-1613. Buklan, A. L. (Chernigov Regional Off. Forensic Expert., Chernigov, USSR). **Ostroye otravleniye tsiramom.** [**Acute poisoning with ziram.**] *Sud.-Med. Eksp.* 17(4): 51; 1974. (Russian)

Pathoanatomical and histopathological investigations of a case of fatal poisoning with ziram are presented. The patient died within a few hours following ingestion of 0.5 liter of ziram solution. Edema of the pia mater and brain; plethora of the myocardium, lungs, brain, pia mater, liver, kidney, gastric wall, and small intestine; diapedetic hemorrhages; stasis; perivascular and pericellular edema; and dystrophy were characteristic findings in the internal organs. Focal atelectases, acute emphysema, desquamation of the epithelium in alveoli and bronchi, and focal necroses in the small intestinal mucosa were observed. Ziram was detected in the gastric contents and in certain internal organs aside from liver, kidney, and brain.

75-1614. Drees, H. (Fed. Minist. of Nutrition, Agric. and For., Bonn, Germany). **Umweltchemikalien: Mit Restriktionen schneller als die USA.** [**Environmental pollutants: faster with restrictions than the USA.**] *Umwelt* 5(1): 52; 1975. (2 references) (German)

Data on the persistence and toxicity of aldrin and dieldrin is presented in connection with recent restrictions on the use of certain organochlorine pesticides in West Germany. Aldrin and dieldrin are 50 times more toxic than DDT, and have practically the same persistence in soil, as aldrin is metabolized mainly to the persistent dieldrin. The allowable daily intake is set at 0.0001 mg/kg of body weight, while the actual daily intake is estimated to amount to 0.00006 mg/kg. The use of aldrin has been restricted to the control of *Otiorrhynchus sulcatus* since 1971, and the use of dieldrin is prohibited categorically. The use of DDT is restricted to dipping young plants. Similar restrictions have been imposed on chlordane, lindane, and heptachlor.

See also **75-1543** **75-1661** **75-1723** **75-1758**

75-1615. Dragsnes, L.; Helgeland, K. (Dep. Microbiol., Dental Fac., Oslo Univ., Blindern, Oslo, Norway). **Effects of the herbicide 2,4,5-T on the incorporation of ^{14}C-thymidine, ^{3}H-uridine and ^{3}H-L-leucine into L 929 cells.** *Acta Pharmacol. Toxicol.* 35(2): 103-112; 1974. (21 references)

The early effects of 2,4,5-T on the incorporation of ^{14}C-thymidine, ^{3}-uridine, and ^{3}H-L-leucine into the acid soluble and acid insoluble fractions of L 929 cells of mouse were investigated. There was a rapid inhibition of incorporation when 2.25 m*M* 2,4,5-T was added to the incubation medium. At concentrations of 0.75 m*M* 2,4,5-T or less, the uptake of ^{3}H-leucine was similar to that observed in the control cells. At higher concentrations 2,4,5-T gradually suppressed incorporation into acid, insoluble protein, whereas ^{3}H-activity increased in the acid-soluble pool, reaching 240% of the control values at 2.25 m*M* 2,4,5-T. Increasing concentrations of the herbicide progressively reduced the incorporation of ^{3}H-uridine into both cell fractions. At the highest concentrations the amount of ^{3}H-activity in the acid insoluble fraction was about 25% and in the acid-soluble fraction about 60% of the control value. The uptake of ^{14}C-thymidine into the acid-soluble pool was only moderately suppressed being reduced to 80% of the control value at 0.75 m*M* 2,4,5-T with no further inhibition at higher concentrations. The incorporation into acid insoluble material decreased linearly with the concentration of 2,4,5-T being reduced to 20% of the control value at 2.25 m*M*.

75-1616. Dragsnes, L.; Helgeland, K.; Jonsen, J. (Dep. Microbiol., Dental Fac. Oslo Univ., Blindern, Oslo, Norway). **Effects of the herbicide 2,4,5-trichlorophenoxyacetic acid on growth and morphology of L 929 cells.** *Acta Pharmacol. Toxicol.* 36(2): 97-102; 1975. (11 references)

The toxic effects of 2,4,5-T on cell growth and morphology were investigated in mouse L 929 cells. There was a dose-dependent inhibition of growth when monolayer cultures of cells were grown in the presence of concentrations of 2,4,5-T from 0.25 to 2.25 m*M*. There was a near cessation of growth at 1.75 and 2.25 m*M*. Cell multiplication was resumed after a lag period of 24 hr when 2.25 m*M* was removed after incubation for 3-6 days. An accumulation of particles in the cytoplasm was observed. The amount and the time of appearance was dose-dependent in the range of 0.5-2.25 m*M*. The particles were of uniform size and were preferentially located to the perinuclear region of the cell. On prolonged incubation in the presence of 2.25 m*M* 2,4,5-T the cells became rounded and detached from the substratum. When the control medium replaced the test medium, the particles in the cytoplasm disappeared and the cells resumed their fibroblast-like structure.

75-1617. Anonymous. **Mirex and reproduction.** *Agric. Res.* 23(3): 16; 1974.

The effect of small amounts of mirex in feed rations on reproduction in chickens and Japanese quail was investigated. Up to 160 ppm of mirex in diets of laying chickens and up to 80 ppm in diets of laying Japanese quail for 12 wk did not affect egg production, egg weight, shell thickness, shell calcium, proportion of broken eggs, or proportion of soft-shelled eggs. There was not a significant effect on eggshell weight, fertility, or hatchability of quail eggs in studies at the Agricultural Research Service's Metabolism and Radiation Research Laboratory, Fargo, ND. Mirex is applied at 1.7 g/acre to control the imported fire ant in the Southeast.

75-1618. Ridsdale, R. E. (S. B. Penick and Co., Orange, NJ). **Resmethrin insecticide and aerosols play dual role in better performance.** *Aerosol Age* 20(5): 42-46; 1975.

Resmethrin, as a man made material, is lower priced than the natural product and replaces pyrethrins at the same concentration without a synergist. Pyrethroids are especially effective against aphids and certain other sucking insects, but will also kill chewing insects. Yellow fever mosquitoes, house flies, American and German cockroaches, Japanese beetles, boll weevils, Colorado potato beetles and confused flour beetles were killed after treatment by one or more of the new pyrethroids tested by the ARS. Some are useful for the disinsection of aircraft and other enclosed areas. A 2% resmethrin aerosol formulation approved by the World Health Organization has just been aproved by the EPA. Resmethrin's extremely low mammalian toxicity makes it one of the safest insecticides available. In a toxicity study no significant changes occurred in dogs or rats as a result of repeated exposures to aerosols of a new formulation, SBP-1382, for 5 hr/day, 5 days/week for 6 weeks at a concentration of 250 mg/m^3. These insecticide concentrations were about 400 times the level experienced during normal household applications. The safety of the product and the virtual non-toxic nature of the total degradation products of resmethrin make it ideal for use in aerosol formulations. Resmethrin can be formulated into oil base aerosols, oil base pressurized sprays, or aqueous pressurized sprays. It has a wide range of uses. It is effective against house flies, mosquitoes, gnats, biting flies, flying moths, roaches, spiders, aphids, thrips, whiteflies, ants, fleas, wasps and hornets. When used as a military aerosol, it is solvent free and utilizes fluorocarbon propellants. The house and garden pressurized sprays can be used directly on plants without harm.

75-1619. Fisher, H. K.; Clements, J. A.; Tierney, D. F.; Wright, R. R. (Cardiovasc. Res. Inst., Univ. California, San Francisco, CA 94122). **Pulmonary effects of paraquat in the first day after injection.** *Am. J. Physiol.* 228(4): 1217-1223; 1975. (43 references)

In order to determine whether surface force changes precede the appearance of lung edema during experimental intoxication due to paraquat, female Sprague-Dawley rats were studied for 1 day following injections of 27 mg/kg i.v. By 24 hr the surface-active material recovered by lung lavage was decreased 32%, and changes in lung microsec-

tions and recoil pressure at half-deflation suggested decreased alveolar stability. Despite a 25% loss in overall body weight, lung weight increased more than 7% and protein concentration in lung lavage fluid increased by 158%. Lung edema was demonstrated morphologically as early as changes in surfactant or lung mechanical properties could be detected. Metabolic studies with lung tissue slices incubated with 450 μM paraquat showed a 4-fold increase in carbon dioxide formed from (1-^{14}C) [glucose, but no significant change in carbon formed from (6-^{14}C)glucose. Acetate oxidation was impaired slightly, but incorporation into lipid was decreased by 70%. The results of this study indicated that paraquat led to both alveolar edema and interference with alveolar surface-active material by 24 hr after i.v. administration. Thus it was concluded that paraquat intoxication is not a suitable model for studying uncomplicated perturbation of the surfactant system.

75-1620. Crowe, M. W.; Swerczek, T. W. (Dep. Vet. Sci., Coll. Agric., Univ. Kentucky, Lexington, KY 40506). **Congenital arthrogryposis in offspring of sows fed tobacco (*Nicotiana tabacum*).** *Am. J. Vet. Res.* 35(8): 1071-1073; 1974. (12 references)

Experiments were performed involving the feeding of tobacco to pregnant sows during the first one-third of pregnancy. In the first experiment, 12 sows were confined on a concrete floor throughout gestation. Nine were fed an aqueous tobacco leaf extract (16 or 32 mg/kg) and 3 of these also received maleic hydrazide (2 ml/day) and mixed insecticide (2 ml/day) in addition to the 16 mg/kg diet of leaf extract. The mixed insecticide contained the active ingredients TDE (23.3%), DDT (11.6%), and dieldrin (2.2%). In a second experiment, 15 sows placed in a bluegrass sod lot were allowed to feed on tobacco stalks and received tobacco stalk juice added to their ration at the average concentration of 0.47 l/sow/day. The juice had a nicotine content of about 0.12%. Congenital arthrogryposis was induced in pigs from sows given tobacco leaf aqueous filtrate and also in pigs from sows given tobacco stalks and tobacco stalk juice. When tobacco leaf filtrate was administered to 9 sows between days 10 and 48 of gestation, 9 offspring of 106 farrowed (7.5%) had gross evidence of arthrogryposis. When tobacco stalks and tobacco stalk juice were given between days 10 and 53, 15 of the 146 offspring (9.4%) had gross evidence of arthrogryposis. All 15 of the deformed pigs were from 5 litters containing a total of 52 pigs. The front and rear legs were involved and the pigs were unable to stand. These sows had farrowed before without history of any deformed pigs. Some of the sows consumed the tobacco stalks voraciously while others refused to eat them voluntarily. Signs of clinical toxicosis were not present in any sow. The occurrence of the malformations seems related to the ingestion of tobacco stalks from a high yield tobacco crop obtained by heavy fertilization, especially with nitrogen. No deformations were noted in the offspring of pigs given the insecticide mixture.

75-1621. Becker, D.; Schumacher, O. P. (Dep. Endocrinol., Cleveland Clin. Fdn., Cleveland, OH). **o,p'-DDD therapy in invasive adrenocortical carcinoma.** *Ann. Intern. Med.* 82(5): 677-679; 1975. (8 references)

The cases of two patients who began treatment with *o,p'*-DDD (TDE) immediately upon diagnosis of adrenal cortical carcinoma are reviewed. Both patients were males, aged 3.5 and 69 yr. Right nephrectomy performed on the boy revealed a right-sided adrenal cortical carcinoma measuring 8 cm x 11 cm x 11 cm and weighing 805 g. The tumor was invading the capsule of the liver and appeared to be infiltrating the inferior vena cava and hepatic veins. *o,p'*-DDD therapy (0.5 mg/twice a day) was started. Decadron (0.25 mg/twice a day) and fluorocortisone acetate (0.1 mg/twice a week) were administered. Two years and 7 months later *o,p'*-DDD therapy was discontinued. Four yr and 1 mo after tumor removal, there was no evidence of recurrence. Laparotomy in the older patient revealed a left-adrenal tumor with evidence of a retroperitoneal hemorrhage and a subscapular hematoma of the spleen posteriorly. The pathologic diagnosis was adrenocortical carcinoma with metastatic spread evidenced in the periadrenal fatty tissues. *o,p'*-DDD therapy (4 g/day) was started and increased over 5 days to 10 g/day as tolerated. At 6 months, doses of more than 1 g/day upset his stomach and the dose was tapered. After 6 yr and 4 mo *o,p'*-DDD therapy was stopped. He had also received throughout the course of therapy Decadron (0.25 mg to 0.5 mg twice daily) and Florinef (0.1 mg/day). There has been no evidence of tumor recurrence for 7 yr 9 mo since tumor removal. The early postoperative use of *o,p'*-DDD in therapy is credited with the increased survival and possible cure of these patients.

75-1622. Desaiah, D.; Cutkomp, L. K.; Koch, R. B.; Jarvinen, A. (Dep. Biochem., Mississippi State Univ., Mississippi State, MS 39762). **DDT: effect of continuous exposure on ATPase activity in fish, *Pimephales promelas*.** *Arch. Environ. Contam. Toxicol.* 3(2): 132-141; 1975. (22 references)

Fat head minnows, 45-days old, were continuously exposed to DDT using continuous water flow and constant temperature conditions. Exposures were to 0.5 and 2.0 ppb of DDT in water, and combinations of the two concentrations with 50 ppm in food, and 50 ppm in food alone, using C^{14}-DDT in food. Brain homogenates were analyzed for enzyme activity from fish treated for 56, 118, 225, and 266 days; and gill analysis was made at 225 and 226 days exposure. Enzyme reductions were greatest in oligomycin-sensitive (mitochondrial) Mg^{2+} ATPase, with pronounced effects (over 50% inhibition) at the 266th sampling day. In contrast, Na^{+}-K^{+} ATPase and oligomycin-insensitive Mg^{2+} ATPase activities were activated by as much as 28% and 40%, respective Mitochondrial Mg^{2+} ATPase of fish brain has been inhibited to the greatest extent in previously reported in vitro studies. All three ATPase enzymes were reduced in gill tissue sampled at the 266th day, with mitochondrial Mg^{2+} ATPase showing the greatest decline. (Author abstract by permission)

75-1623. Dieter, M. P. (Patuxent Wildlife Research Center, Laurel, MD 20810). **Further studies on the use of enzyme profiles to monitor residue accumulation in wildlife: plasma enzymes in starlings fed graded concentrations of Morsodren, DDE, Aroclor 1254, and malathion.** *Arch. Environ. Contam. Toxicol.* 3(2): 142-150; 1975. (22 references)

Wild-trapped starlings (*Sturnus vulgaris*) were fed concentrations of Morsodren (methylmercury dicyandiamide) (2, 4, and 8 ppm), DDE or Aroclor 1254 (5, 25, and 100 ppm), or malathion (8, 35, 160 ppm) that were found to be sublethal in pen-reared coturnix quail fed these amounts for 12 weeks. Plasma enzymes had to be measured earlier than planned in starlings fed Morsodren (at three weeks) or the organochlorine compounds (at seven weeks) because of unexpected, subsequent mortality. Variations in enzyme response were greater in wild than in pen-reared birds, but not enough to mask the toxicant-induced changes in enzyme activity. Cholinesterase activities decreased in birds fed Morsodren or malathion, and increased in those fed the organochlorine compounds. Lactate dehydrogenase activities increased two-fold in starlings fed Morsodren and two- to four-fold in those fed the organochlorine compounds, but only 50% in those fed malathion. Further examination of enzyme profiles showed that creatine kinase and aspartate aminotransferase activities increased two-to four-fold in birds fed Morsodren or the organochlorine compounds but not at all in those fed malathion. Thus the classes of environmental contaminants fed to starlings could be easily distinguished by these enzymatic parameters. Evaluation of enzymatic profiles appears to be a potentially valuable technique to monitor the presence of toxicants in wild populations, especially if used to complement standard chemical residue analyses. Here the residue analyses showed, after three weeks feeding, that mercury in the carcasses reflected the concentrations fed daily, whereas accumulation in the livers was two- to four-fold greater. After seven weeks feeding, liver residues of either organochlorine compound were about three-fold higher than the concentrations fed daily. However, four times as much DDE as Aroclor 1254 had accumulated in the carcasses. (Author abstract by permission)

75-1624. Lindstrom, F. T.; Gillett, J. W.; Rodecap, S. E. (Dep. Math. and Agric. Chem., Oregon State Univ., Corvallis, OR 97331). **Distribution of HEOD (dieldrin) in mammals: II. Some applications of the preliminary model.** *Arch. Environ. Contam. Toxicol.* 3(2): 166-182; 1975. (26 references)

The preliminary model of the lipid-phase pharmacokinetics of dieldrin in mammals is applied to evaluation of the probable role of auto-induction, the effect(s) of growth, and the role of compartmentalization. Realistic simulations and comparison to actual data permit the conclusion to be drawn that induction of its own metabolism plays a relatively minor role in the distribution and level of dieldrin residues. Although some of the effects of growth are reasonably well simulated, the model as constructed does not permit compartmentalization. It was concluded that the model should be revised to include aspects of the as-yet quantitatively unknown intracellular binding and membrane transport within the flow-limited model. (Author abstract by permission)

75-1625. DaSilva, E. J.; Henriksson, L. E.*; Henriksson, E. (Inst. Physiol. Botany, Univ. Uppsala, Uppsala, Sweden). **Effect of pesticides on blue-green algae and nitrogen-fixation.** *Arch. Environ. Contam. Toxicol.* 3(2): 193-204; 1975. (28 references)

The effects of the pesticides amitrole, an amitrole derivate (3,5-diamino-1,2,4-triazole), diquat, paraquat, linuron, MCPA, malathion and monuron were studied on the nitrogen-fixing algae, *Anabaena cylindrica, Aulosira* sp., *Calothrix elenkenii, Chlorogloeae fritschii, Cylindrospermum muscicola, Nostoc* sp. from *Collema tenax, Nostoc muscorum, Tolypothrix tenuis*, and *Westiellopsis* sp. In general, two types of response were discernible: an initial period of depression succeeded by an increased activity and an initial period of depression followed by a distinct decrease on prolonged incubation. The results indicate that some pesticidal compounds can severely limit the nitrogen-fixing capacities of blue-green algae, thereby affecting the overall nitrogen economy of soils in general. (Author abstract by permission)

75-1626. Simeon, V. (Inst. Med. Res., Yugoslav Acad. Sci. Arts, Zagreb, Yugoslavia). **Effect of acetylcholine on inhibition of cholinesterases by acylating inhibitors.** *Arh. Hig. Rada Toksikol.* 25(1): 51-55; 1974. (14 references)

The effect of acetylcholine on the inhibition of cholinesterases by acylating inhibitors was studied. Theoretical rates of inhibition in the absence and presence of acetylcholine were calculated. The *Km* and *Kss* constants used in the calculation were both evaluated experimentally and taken from published data. It is concluded that the reported concentration of acetylcholine in mammalian brain, 10 μM or higher, should provide some protection to acetylcholinesterase against inhibition by organophosphates and carbamates. This would be particularly so if acetylcholine is not equally distributed, in which case it could be very efficient in competing with an inhibitor for the active site of acetylcholinesterasse. In case of anticholinesterase poisoning, the accumulated acetylcholine will decrease the rate of inhibition thus providing more time for the inhibitor to become removed from its place of action and for the enzyme to become spontaneously reactivated.

75-1627. Grove, J. F.; Hosken, M. (Agric. Res. Council, Unit Invertebrate Chem. and Physiol., Univ. Sussex, Brighton, Sussex, England). **The larvicidal activity of some 12,13-epoxytrichothec-9-enes.** *Biochem. Pharmacol.* 24(9): 959-962; 1975. (20 references)

Seventeen naturally occurring 12,13-epoxytrichothec-9-enes and 19 of their derivatives and transformation products have been tested for larvicidal activity against *Aedes aegypti* and the majority have been examined for toxicity to mammalian cells in tissue culture.

The principal structural requirements for high biological activity were the same in both tests, and only a small number of examples of selectivity of action were encountered. Of these trichodermin alone was larvicidal but nontoxic to mammals by oral administration and only mildly dermatitic. (Author abstract by permission)

75-1628. Desaiah, D.; Koch, R. B. (Dep. Biochem., Mississippi State Univ., Mississippi State, MS 39762). **Inhibition of fish brain ATPases by aldrin-transdiol, aldrin, dieldrin and photodieldrin.** *Biochem. Biophys. Res. Commun.* 64(1): 13-19; 1975. (34 references)

The sensitivity of catfish, *Ictalurus punctatus*, brain ATPase activities to cyclodiene compounds was investigated. The ATPase system showed differences in sensitivity to aldrin, dieldrin and photodieldrin. However, aldrin-transdiol (a more terminal metabolite of dieldrin and reported as a more potent neurotoxin than dieldrin) had no effect on any ATPase activity from fish brain homogenates. Mitochondrial Mg^{2+} ATPase was the most sensitive ATPase to the cyclodiene compounds tested. The possibility that the neurotoxic effects of these compounds is a secondary response resulting from mitochondrial Mg^{2+} ATPase inhibition is discussed. (Author abstract by permission)

75-1629. Francis, A. J.; Spanggord, R. J.*;Ouchi, G. I. (Life Sci. Div., Stanford Res. Inst., Menlo Park, CA 94025). **Degradation of lindane by *Escherichia coli*.** *Appl. Microbiol.* 29(4): 567-568; 1975. (5 references)

Lindane was degraded by *Escherichia coli* isolated from rat feces. About 10% of the added lindane was metabolized by the bacterium in trypticase soy broth containing the pesticide. A single metabolite, 2,3,4,5,6-pentachloro-1-cyclohexene, was detected and identified by gas chromatography and mass spectrometry. (Author abstract by permission)

75-1630. Takahashi, Y.; Saito, T.; Iyatomi, K.; Eto, M. (Nagoya Univ., Nagoya, Japan). [**Joint toxic action of organophosphorus compounds and various compounds in resistant citrus red mites. II. Mechanism of synergistic action between malathion and K-1 (2-phenyl-4H-1,3,2-benzodioxaphosphorin-2-oxide) in organophosphate-resistant citrus red mites.**] *Bochu-Kagaku (Sci. Pest. Contr.)* 38(1): 13-21; 1973. (31 references) (Japanese)

In organophosphate-resistant and -susceptible strains of citrus red mite, the mechanism of synergistic action of K-1 (2-phenyl-4H-1,3,2-benzodioxaphosphorin-2-oxide) with malathion was examined. The cholinesterase activity of susceptible strain (PS) was higher than that of resistant strains (SK and R), and the susceptibilities of cholinesterase in SK and K strains were lower than those of PS strain against malaoxon and malathion. It is suggested that the organophosphate resistance of citrus red mite is partly due to the decreased sensitivity of cholinesterase to organophosphates. With in vivo experiments, K-1 caused the cholinesterase inhibition of malathion and the inhibition process was by the additive inhibition of malathion and malaoxon. The activities of β-naphthyl acetate hydrolyzing enzymes of resistant strains were higher than those of the susceptible strain in vitro. However, there was no relationship between the susceptibilities to organophosphates and the activities of β-naphthyl acetate hydrolyzing enzyme. In in vivo and in vitro experiments, the breakdown activities of ^{32}P-malathion in organophosphate-resistant and -susceptible strains revealed that the resistant strains were superior in the ability to detoxify malathion as compared with that of the susceptible strain. The amounts of carboxyesterase products were decreased by K-1 treatment in both resistant and susceptible strains. It was supposed that K-1 inhibits carboxyesterase, one of the breakdown enzymes of malathion.

75-1631. Vargova, M.; Kovalcik, V. (Natl. Inst. Hyg., Bratislava, Czechoslovakia). **Nove pristupy k rieseniu toxicity latok po opakovanom podavani.** [**New approaches to the solution of the toxicity of substances following repeated administration.**] *Bratislav. Lek. Listy.* 60(2): 182-187; 1973. (9 references) (Czech)

Problems concerning the choice of animal species, intersexual differences, and the method of application in determining the toxicity of insecticides are considered. Heptachlor is used for experiments. The acute toxicity (LD50 at 40, 80, and 160 mg/kg) of heptachlor is not significantly different in mice and rats. The rat is more sensitive than the mouse to the lethal effect of heptachlor following a repeated administration. With regard to gender, it is found that heptachlor toxicity, following a repeated administration, is higher in the male mice than in the females, but lower in the male rats than in the females. In comparing the toxicity of heptachlor following a peroral and an intraperitoneal administration, toxicity is higher following the peroral administration.

75-1632. Dettbarn, W. D.; Hoskin, F. C. G. (Pharmacol. Dep., Vanderbilt Univ., Nashville, TN). **Toxicity of DFP and related compounds to squids in relation to cholinesterase inhibition and detoxifying enzyme levels.** *Bull. Environ. Contam. Toxicol.* 13(2): 133-140; 1975. (17 references)

Paraoxon (0.5-0.2 mg/kg), DFP (20.9-75.0 mg/kg), physostigmine (2.2-11.0 mg/kg), and 217AO (*O,O*-dimethyl *S*-(2-dimethylaminoethyl) phosphorothioate)) (1.0-4.0 mg/kg) were injected into the optic orbit of squids (*Loligo pealei*) collected near Woods Hole, Massachusetts. The effects on cholinesterase (ChE) activity were determined colorimetrically. Animals injected with inhibitor often became extremely active, displayed a rapidly pulsating change in pigmentation, discharged ink, and sometimes made leaps of 1 meter or more. With less toxic doses, they would return to normal behavior after 10-20 minutes; at higher doses, they would become white, swim violently in a disoriented manner, then return to normal; and at lethal doses, they would remain white, then float away. DFP caused the most violent reactions, followed by paraoxon, 217AO, and physostigmine. On the average, a lethal dose of DFP or 217AO caused a 90% or greater reduction in ChE activity, and a lethal dose of paraoxon caused a 75% reduc-

tion compared with untreated animals. A lethal dose of DFP was about 30 times larger than a lethal dose of either 217AO or paraoxon.

75-1633. Roberts, D. (Dep. Zool., Queen's Univ., Belfast, Northern Ireland). **Differential uptake of endosulfan by the tissues of *Mytilus edulis*.** *Bull. Environ. Contam. Toxicol.* 13(2): 170-176; 1975. (14 references)

The rates of assimilation and elution of endosulfan by different tissues of the common mussel, *Mytilus edulis*, and the scallop, *Chlamys opercularis*, were compared. Eighty mussels were exposed to 0.1 mg/l of endosulfan for 36 days; they were then transferred to clean seawater for 23 days. The pesticide residues in the digestive gland, mantle plus gonad, gills, and remaining tissue were extracted and analyzed using electron capture column chromatography. The major site of concentration of endosulfan in both species was the digestive gland (6.1-6.2 μg/g). The residue concentrations in the foot, anterior, and posterior adductor muscles of *M. edulis* were similar to those in the adductor muscle of *C. opercularis*. However, the residue level in the gills of *M. edulis* (2.1 μg/g) was much greater than that in the gills of *C. opercularis* (0.46 μg/g) while the levels in the gonad and mantle of *C. opercularis* (3.8 μg/g) were much higher than those in the same structures of *M. edulis* (1.34 μg/g). Despite the differences in distribution, the total mean tissue residues for the two species were similar (2.57 and 2.85 μg/g for *C. opercularis* and *M. edulis*, respectively). The maximum residue level was reached significantly earlier in the digestive gland than in other tissues. On removal to clean seawater, the residues initially declined fairly rapidly in all tissues, especially the digestive gland; during the final 6 days, in clean water, the residue loss was similar for all tissues.

75-1634. Gutenmann, W. H.; Lisk, D. J. (Pesticide Residue Lab., Food Sci. Dep., New York State Coll. Agric., Cornell Univ., Ithaca, NY). **A feeding study with diphenylamine in a dairy cow.** *Bull. Environ. Contam. Toxicol.* 13(2): 177-180; 1975. (4 references)

A 534-kg Holstein cow was fed pure recrystallized diphenylamine (DPA) anti-scald at a rate of 5 ppm (based on a daily ration of 22.7 kg) for 4 days. Morning and evening milk samples taken 1 day before the begining of DPA treatment, during DPA treatment, and for 6 days after the cessation of treatment were analyzed for DPA residues; the urine and feces were similarly analyzed. DPA residues were not detected in the milk or urine, although small amounts (6.2 mg or 1.4% of the total dose) were found in the feces. The stability of DPA in the presence of fresh rumen fluid and the metabolism of DPA in fresh beef liver microsomes and soluble enzymes were studied in vitro. DPA was stable in the presence of rumen fluid for 23 hours, and about 50% of the added dose disappeared within 30 minutes of incubation with the liver fraction. No conjugates of intact DPA were detected in urine which had been hydrolyzed with acid. The microsomal hydroxylation of DPA may occur in the bovine followed by conjugation and elimination.

75-1635. Ingham, B.; Gallo, M. A. (Chipman Division of Rhodia Inc., New Brunswick, NJ 08903). **Effect of asulam in wildlife species; acute toxicity to birds and fish.** *Bull. Environ. Contam. Toxicol.* 13(2): 194-199; 1975. (7 references)

Rainbow trout (*Salmo gairdnerii*,) channel catfish (*Ictalurus punctatus*), goldfish (*Carassius auratus*), and bluegills (*Lepomis macrochirus*) were housed in bioassay vessels containing calcium sulfate (30 mg/l), magnesium sulfate (30 mg/l), sodium bicarbonate (48 mg/l), and potassium chloride (3 mg/l); various doses of DDT and asulam were added to the vessels. In another experiment, mallard ducks (*Anas platyrhynchos*), partridges (*Perdix perdix*), pheasants (*Phasianus colchicus*), and domestic pigeons (*Columba livia*) were treated orally with varying doses of DDT and asulam. In a third experiment, subacute studies were conducted using 7-day-old mallard ducklings and pheasant chicks. In the fish, exposure to DDT resulted in a linear mortality response in all four species. Twenty percent of the goldfish and catfish died at the 5000 ppm and 3000 ppm levels of asulam, no mortalities occurring in the other species or at other concentrations. Thus, in normal use patterns, asulam would not be hazardous to fish. In the birds, asulam (4000 mg/kg) resulted in mortality in 70% of the partridges, 10% of the mallards, and 20% of the pheasants within 21 days; mortality rates were at control levels at other dose levels. The only lesions in the dead birds were serous fluid in the body cavity, edematous lungs, and congested liver. After 21 days, the only lesions in the living birds were fatty livers in three pigeons. The results of the 8-day LC50 experiments in the chicks and ducklings indicated that asulam is relatively nontoxic and would not present a hazard to these species in the wild.

75-1636. Gallo, M. A.; Guardigli, A.; McGinnis, C. H., Jr. (Chipman Div., Rhodia Inc., New Brunswick, NJ 08903). **Effect of asulam in wildlife species: residues and toxicity in bobwhite quail after prolonged exposure.** *Bull. Environ. Contam. Toxicol.* 13(2): 200-205; 1975. (7 references)

Sixteen, 22, and 27 week old bobwhite quail (*Colinus virginianus*) were maintained for 4 weeks on diets containing 0, 1.5, 6.0, or 25.0 ppm asulam. During the following 3 weeks, they were maintained on normal diets without asulam. The pesticide residues in various tissues were analyzed using the Bratton-Marshall reaction. Asulam had no effect on food consumption, body weight, or cumulative mortality, and no signs of toxicity were seen during the 28-day feeding period. Similarly, the chemical had no effect on egg production, fertility, or hatchability of fertile eggs, or on abnormalities in the F_1 generation. The amounts of asulam recovered from the tissues varied according to the tissues studied; the kidneys, leg muscles, and liver contained the greatest amounts, 0.13, 0.14, and 0.11 ppm, respectively. During the withdrawal period, the liver contained 0.12 ppm asulam, but residues were not found in any other tissues. The data indicates that there are no imminent or long term hazards to quail from the application of asulam in the field.

75-1637. Sanborn, J. R.; Childers, W. F.; Metcalf, R. L. (Illinois Natural History Survey, Illinois Aric. Exp. Stn., Urbana, IL 61801). **Uptake of three polychlorinated biphenyls, DDT, and DDE by the green sunfish, *Lepomis cyanellus* Raf.** *Bull. Environ. Contam. Toxicol.* 13(2): 209-217; 1975. (16 references)

Green sunfish (*Lepomis cyanellus* Raf.) were placed in jars of aged tap water to which was added one of three PCBs (2,2′,5-trichlorobiphenyl, 2,2′,5,5′-tetrachlorobiphenyl, or 2,2′,′-pentachlorobiphenyl), DDT, or DDE at dose levels of 1 or 3 ppb. The tissues of the fish were analyzed for residues using thin-layer chromatography. DDT, DDE, and the pentachlorobiphenyl had similar uptake curves in regard to retention of the compounds after they were added to the environment. The retention of the tetrachlorobiphenyl was somewhat less; a few days after the peak concentration was reached in the tissues, the levels began to drop. With the trichlorobiphenyl, the tissue concentration dropped sharply after reaching a peak; this indicates that the green sunfish is able to transform the trichlorobiphenyl into polar species.

75-1638. Kasuya, M. (Dep. Pub..Health, Sapporo Med. Coll., Sapporo, Japan). **Sensitivity of spinal cords from chick embryos in culture to organic mercury compounds: comparison with dorsal root ganglia.** *Bull. Environ. Contam. Toxicol.* 13(2): 223-225; 1975. (4 references)

Cultured spinal cords and dorsal root ganglia from 9-10 day old chick embryos were incubated with varying amounts of methylmercuric chloride (MMC), ethylmercuric chloride (EMC), ethyimercuric phosphate (EMP), and phenylmercuric chloride (PMC). The toxicity of these compounds for the spinal cords and ganglia was determined based on the lowest dose required for total inhibition of fiber and cell outgrowth. The lowest doses of MMC, EMC, EMP, and PMC required for total inhibition of the spinal cord were 2.5, 10, 5, and 2.5 μM, respectively. Thus, the chick embryo spinal cord appears to be more sensitive that the dorsal root ganglia to organic mercury toxicity.

75-1639. Cooke, A. S.; Zoro, J. A. (Monks Wood Exp. Stn., Abbots Ripton, Huntingdon, England). **The effects of *p,p′*-DDCN on tadpoles of the frog *Rana temporaria*.** *Bull. Environ. Contam. Toxicol.* 13(2): 233-237; 1975. (10 references)

Tadpoles of the frog *Rana temporaria* (Stages V-XIII) were exposed to DDT degradation product *p,p′*-DDCN (0, 0.001, 0.01, 0.1 1.0 ppm dissolved in acetone) for 48 hours, after which they were transferred at aged tap water for 6 days. The pesticide residues were extracted from the tadpoles and analyzed by electron capture gas-liquid chromatography. After 24 hours, 34% and 78% of the *p,p′*-DDCN initially added to the water could be accounted for by residues in the tadpoles in the 0.1 and 1.0 ppm treatment groups, respectively; no residues were detected in the other treatment groups. The residues were rapidly lost when the tadpoles were transferred to clean water. None of the tadpoles died, but those in the 1.0 ppm treatment group behaved abnormally, first becoming hyperactive and then weak and lethargic; by the end of the treatment period 1/3 of this group had upcurved tails. The abnormal behavior and upcurved tails disappeared within 1-3 days in clean water. The tadpoles in the control group showed a significantly faster rate of metamorphosis than those in the 0.001 ppm treatment group, and those in the 0.001 ppm treatment group showed a significantly faster rate of metamorphosis than those in the other treatment groups. The tadpoles in the higher dose groups tended to be less advanced than the controls, but the differences were not significant.

75-1640. Desaiah, D.; Koch, R. B. (Dep. Biochem., Mississippi State Univ., Mississippi State, MS 39762). **Toxaphene inhibition of ATPase activity in catfish, *Ictalurus punctatus*, tissues.** *Bull. Environ. Contam. Toxicol.* 13(2): 238-244; 1975. (12 references)

The inhibition pattern of toxaphene on the ATPase activities of brain, kidney, and gill tissues from pond-cultured channel catfish, *Ictalurus punctatus*, was studied in vitro. Toxaphene inhibited all three ATPase in the brain to the extent of at least 50%, with the greatest effect being on the oligomycin-insensitive Mg^{2+} ATPase, followed by the oligomycin-sensitive (mitochondrial) Mg^{2+} ATPase and Na^{+}-K^{+} ATPase.The inhibitory effect on the kidney ATPase was reduced compared with the effect on the brain enzymes. The oligomycin-insensitive Mg^{2+} ATPase activity showed increasing inhibition with increasing toxaphene concentration; the kidney mitochondrial Mg^{2+} ATPase activity was stimulated at low concentrations and inhibited at higher concentrations. All concentrations of toxaphene inhibited the kidney Na^{+}-K^{+} ATPase activity by about 30%; the presence of more than one type of Na^{+}-K^{+} ATPase activity may be indicated. The inhibition pattern of the gill oligomycin-insensitive Mg^{2+} ATPase was similar to that of the same enzyme in the brain, but the inhibition patterns of the other two gill enzymes were similar to those of the two kidney enzymes.

75-1641. Dieter, M. P.; Ludke, J. L. (Patuxent Wildlife Res. Cent., Bur. Sport Fish. Wildl., Laurel, MD 20810). **Studies on combined effects of organophosphates and heavy metals in birds. I. Plasma and brain cholinesterase in coturnix quail fed methyl mercury and orally dosed with parathion.** *Bull. Environ. Contam. Toxicol.* 13(3): 257-261; 1975.

The effects of mercury on the toxicity and biochemical effects of parathion were investigated with male coturnix quail (*Coturnix coturnix japonica*). The birds were fed a sublethal concentration of morsodren (methyl mercury dicijan diamide 4 ppm as methyl mercury) for 18 wk, which resulted in accumulation of 21.0 ppm Hg in the liver and 8.4 ppm in the carcass. Birds fed clean feed and those fed morsodren-treated feed were orally dosed with 2,4,6,8,

and 10 mg/kg parathion, and their 48-hour survival times compared. The computed LD 50 was 5.86 mg/kg in birds not fed morsodren and 4.24 in those fed the heavy metal. Cholinesterase in the plasma was already inhibited 90% by parathion alone (1.0 mg/kg oral dose). The effect of morsodren on brain cholinesterase was severe enough to seriously interfere with the diagnosis of organophosphate poisoning, as parathion inhibition of the enzyme in morsodren-fed birds was almost twice that in clean-fed ones.

75-1642. Yu, C. C.; Hansen, D. J.; Booth, G. M. (Dep. Entomol., Agric. Exp. Stn., Geneva, NY 14456). **Fate of dicamba in a model ecosystem.** *Bull. Environ. Contam. Toxicol.* 13(3): 280-283; 1975. (12 references)

The fate of dicamba was determined in a model ecosystem which has been used to evuluate the biodegradability and magnification of several pesticides in a food chain. Concentrations of dicamba and its metabolites in the water reached a peak (0.2364 ppm) at the 6th day after application, and then the radioactivity decreased very slowly to 0.0669 ppm on day 32. Very small amounts (0.2%) of the radioactive materials could be extracted by ethyl ether from the unhydrolyzed water. After hydrogen chloride hydrolysis, 98.8% of the dicamba and its metabolites could be extracted by ether. This indicates that most of the dicamba and its metabolites are conjugated or are present in anionic forms in unhydrolyzed water and cannot be extracted by ether. Solvent extracts of water and crab which has higher radioactivity were analyzed by paper chromatography and radioautography. There were three spots on the radioautogram in unhydrolyzed water. In contrast, there was no detectable parent dicamba in crab extract.

75-1643. Waggoner, J. P., III; Zeeman, M. G. (Dep. Biol. Sci., Univ. Southern California, Los Angeles, CA 90007). **DDT: short term effects on osmoregulation in black surfperch (*Embiotoca jacksoni*).** *Bull. Environ. Contam. Toxicol.* 13(3): 297-300; 1975. (11 references)

The short-term effects of DDT on osmoregulation in black surfperch (*Embiotoca jacksoni*) were determined. Fish were injected intraperitoneally with corn oil in which 100% technical DDT was dissolved in concentrations calculated to result in total injected doses of 0, 1, 10, 100, and 200 ppm in the whole fish. Only the highest injected dose of DDT affected blood plasma electrolytes to any significant degree ($p < .01$). All fish survived 12 hr at any given dose. In the 72 hr experiment, all fish survived at doses below 100 ppm DDT. Mortality was noted at the 100 ppm and 200 ppm DDT doses. Three out of 12 fish injected with 100 ppm DDT died between 60 and 72 hr. Of the eight fish injected with 200 ppm DDT, four died before blood samples could be taken. The four fish from which blood was obtained were moribund and showed typical symptoms of DDT poisoning. Only one of these fish survived the full 72 hr. The mean survival time for these four fish was 44 hr. Osmoregulatory breakdown did not seem to be the principal cause of death in these DDT poisoned fish. Direct action of DDT on vital tissues (brain and spinal cord) seems more likely as the cause of death.

75-1644. Watson, M.; Pharaoh, B.; Wyllie, J.; Benson, W. W. (Idaho Community Study on Pesticides, Statehouse, Boise, ID 83720). **Metabolism of low oral doses of DDT and DDE by tame mule deer fawns.** *Bull. Environ. Contam. Toxicol.* 13(3): 316-623; 1975. (23 references)

The metabolism of orally administered DDT and DDE in two captive fawn mule deer, *Odocoileus heminonus*, was determined. Deer 1 was given one 5 mg DDE cube daily. Deer 2 received a 5 mg DDT cube daily. Doses were maintained for a total of 30 days for both animals. In deer 1, serum DDE levels increased rapidly as the dosing period progressed, reaching a plateau of about 14 ppb midway through the period and falling to below 5 ppb 8 days after doses had ceased. Levels of DDT increased briefly early in the dosing period, after which no DDT was detected until well after pesticide doses had stopped. No DDD (TDE) was found in the serum until after doses had stopped; no DDT was detected at any time. Serum DDE was not detected in deer 2, nearly equal quantities of DDT and TDE were present. Levels of DDT reached a plateau quickly at 3.5 ppb, while TDE levels were slightly lower. Serum levels of both residues decreased abruptly within 4 days after doses had been stopped, but both substances experienced a brief increase again 2 wk later. No DDT was detected. Fecal pesticides in deer 1 were similar to serum. In contrast to serums from deer 2, fecal pesticides from this animal contained much greater levels of TDE than of DDT.

75-1645. Hutacharern, C.; Knowles, C. O. (Dep. Entomol., Univ. Missouri, Columbia, MO 65201). **Metabolism of chloropyrifos-^{14}C in the eastern subterranean termite.** *Bull. Environ. Contam. Toxicol.* 13(3): 351-356; 1975. (8 references)

The metabolic fate of chlorpyrifos-^{14}C in the eastern subterranean termite, *Reticulitermes flavipes* (Kollar), was determined. Two hundred termites were treated topically on the thorax with chlorpyrifos-^{14}C; each termite received 500 cpm of chlorpyrifos-^{14}C dissolved in 0.5 μl of acetone. The termites were kept moist and in the dark at 26°C for periods, of 1, 4, 8, and 16 hr. They were then rinsed twice with acetone. The radioactive materials in the external termite rinse and in the metabolism chamber decreased with time, indicating that the termites were absorbing the chlorpyrifos. The major path for chlorpyrifos metabolism was oxidative desulfuration to chlorpyrifos oxygen analog. There was also evidence for some dechlorination of chlorpyrifos and 3-dechlorchlorpyrifos. Subsequent metabolism of chlorpyrifos and chlorpyrifos oxygen analog to water soluble metabolites proceeded slowly. The efficacy of chlorpyrifos as a termiticide is related to the rapid formation and relatively slow degrada-

tion of the toxic chlorpyrifos oxygen analog in the eastern subterranean termite.

75-1646. David, D. (Equip. Rech. Assoc. CNRS No. 408, Lab. Biol. Anim., Aubiere, France). **DDT et population germinale des gonades embryonnaires d'oiseau. Traitement des oeufs a divers stades de l'incubation.** [**DDT and gonocyte count of embryonic gonads in birds. Treatment of eggs at different stages of incubation.**] *C. R. Hebd. Seances Acad. Sci. Ser. D* 280(6): 745-748; 1975. (5 references) (French)

The effect of DDT on the gonocyte counts in chick and quail embryos was studied as a function of the time of treatment with respect to the incubation. Eggs were immersed in water containing a 0.5% concentration of 50% DDT for 30 sec. When eggs were immersed in DDT suspension before incubation, a sharp reduction of the gonocyte populations and an increased incidence of pyknotic cells were observed on the 6th day of incubation in the case of chick embryos and on the 5th day of incubation in the case of quail embryos. Treatment at later dates, e.g., at the start or at the end of gonocyte migration, had no effect on the gonocyte count. However, the rate of degeneration was still higher than in a control group. The findings indicate a direct toxic action of DDT on the gonocytes. The pesticide may inhibit the migratory capacity of the gonocytes.

75-1647. Hajjar, R. A.; Hickey, R. C.; Samaan, N. A.* (Section Endocrinol., M. D. Anderson Hosp., Houston, TX 77025). **Adrenal cortical carcinoma; a study of 32 patients.** *Cancer* 35(2): 549-554; 1975. (14 references)

The use of DDD (TDE) in the treatment of patients with adrenal cortical carcinoma is described. A total of 32 patients, 15 male and 17 female, was studied. Fifteen of them were treated with TDE either after surgery or as the only mode of therapy. The average initial maximal dose was 10 g, which was gradually reduced, after development of intolerance, to a maximum tolerable dose of 2-3 g/day. The side effects primarily were nausea (10 patients), vomiting (7 patients), and weakness (5 patients). Vertigo, blurred vision, and decreased hearing ability occurred in 1 patient, and depression and peripheral neuropathy in another. Fourteen patients had a measurable tumor, but four of them received TDE for less than 3 wk (due to death). Five patients showed no tumor reduction, four showed only transient steroid suppression lasting from 1-4 mo, and one showed tumor regression for 2 mo. There was no statistical difference between the survival rate of those treated surgically and those treated by both surgery and drug. Those treated by drug alone had a much shorter survival, probably because only the advanced cases underwent no operation.

75-1648. Cappon, I. D.; Nicholls, D. M. (Dep. Biol., York Univ., Toronto, Ontario, Canada). **Factors involved in increased protein synthesis in rat kidney after administration of DDT.** *Chem.-Biol. Interactions* 9(6): 395-409; 1974. (55 references)

Homogenates of kidney cortex obtained from control rats and rats treated with DDT were separated into microsomes or ribosomes, and into postmicrosomal (S105) supernatant fraction of pH 5 supernatant fraction. Male Sprague-Dawley rats were used for the study. DDT was administered by i.p. injection on two consecutive days, 200 mg DDT/kg body weight each day. The kidneys and livers were removed 72 hr after the second dose. The incorporation of (^{14}C)phenylalanyl-tRNA into peptide was increased when microsomes derived from kidneys of DDT-treated rats were incubated with pH 5 supernatant fraction from controls. Elongation factors 1 and 2, necessary for the binding of aminoacyl-tRNA to ribosomes and for translocation of peptidyl-tRNA from the A site to the P site of ribosomes, were present in the pH 5 supernatant fractions of kidney of control and DDT-treated rats and these fractions were incubated with KC1-washed ribosomes obtained from livers of controls. The results provided evidence that the increased incorporation observed with the pH 5 supernatant fraction obtained from the DDT-treated animals could not be attributed to decreased ribonuclease activity or to increased elongation factor 2 activity but was due to an increase in elongation factor 1 activity.

75-1649. Hook, G. E. R.; Haseman, J. K.; Lucier, G. W. (Natl. Health Inst. of Environ. Health Sci., Research Triangle Park, NC). **Induction and suppression of hepatic and extrahepatic microsomal foreign-compound-metabolizing enzyme systems by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** *Chem.-Biol. Interactions* 10(3): 199-214; 1975. (61 references)

The effect of dioxins on hepatic and extrahepatic foreign-compound-metabolizing enzyme systems in microsomes from rats, rabbits, and guinea pigs were investigated. The *N*-demethylation of benzphetamine, aminopyrine, and ethylmorphine was suppressed following dioxins treatment in hepatic microsomes from C-D male albino rats, but not from pregnant C-D rats. Both cytochrome P-450 and benzpyrene hydroxylase were significantly stimulated in hepatic microsomes from both male and female rats at doses as small as 1 mg dioxins/kg body weight. Benzpyrene hydroxylase of male rat liver microsomes remained significantly elevated for 73 days after a single oral dose of 25 mg/kg body weight. The suppression of benzphetamine *N*-demethylase was gone after 35 days. The effect of age on these enzymes was determined. Benzpyrene hydroxylase was unaffected in hepatic microsomes from Hartley albino New Zealand rabbit liver. Benzphetamine *N*-demethylase was also suppressed in rabbit liver microsomes. The only lung enzyme responsive to dioxins was biphenyl 4-hydroxylase of the rabbit and guinea pig.

75-1650. Nakagawa, M.; Ishikawa, K.; Suzuki, Y.; Uchiyama, M. (Pharm. Inst., Aobayama, Sendai, Japan). **Effect of organophosphate pesticide on acid cholesterol esterase in rat liver.** *Chem. Pharm. Bull.* 23(1): 240-242; 1975. (9 references)

The effect of dichlorvos on the acid cholesterol esterase in liver of female albino Wistar rats was investigated. The highest hydrolysis rate of the cholesterol ester was obtained in the 9000 *g* precipitates. The major portion of the esterase in those precipitates may be lysosomal esterase. Osmotic treatment of the precipitates and the presence of dichlorvos stimulated esterase activity. The esterase activities in the osmotic treated 9000 *g* precipitates and the supernatant solution obtained by centrifugation after the osmotic treatment of the 9000 *g* precipitates were no longer stimulated with the addition of dichlorvos. The stimulatory effect of dichlorvos may be due to the release of the esterase by the disruption of lysosomal membrane or the observation in which several lysosomal enzymes are released by the treatment of tetraethyldithiopyrophosphate, rather than the direction of dichlorvos to the esterase.

75-1651. Fulde, S.; Bakuniak, E.; (Institute for Technical-Organic Chemistry, Warsaw, Poland). **Bromphenvinphos, ein neues maessing toxisch wirkendes Insektizid gegen Kartoffelkaefer. [Bromfenvinphos, a new moderately toxic insecticide against the Colorado beetle.]** *Chem. Tech. (Leipzig)* 27(2): 86-88; 1975. (16 references) (German)

The uses and toxicity of bromfenvinphos are described. Bromfenvinphos is a new, moderately toxic insecticide for use against Colorado potato beetle and other arthropods, developed in Poland with the aim of replacing the highly toxic chlorfenvinphos. Bromfenvinphos (*0,0* - diethyl - *0* - 1 - (2,4 - dichlorophenyl) - 2 - bromovinylphosphate) is characterized by reduced oral and cutaneous toxicity as compared with chlorfenvinphos (LD50 between 50 and 150 mg/kg as opposed to <50 mg/kg for chlorfenvonphos).

75-1652. Schuphan, I. (Inst. Pflanzenschutzmittelforsch., Biol. Bundesanstalt, Berlin, Germany). **Zum Metabolismus von Phenylharnstoff-Herbiziden. IV. Synthese von hydroxylierten Phenylharnstoffen. [Metabolism of phenylurea derived herbicides. IV. Synthesis of hydroxylated phenylurea compounds.]** *Chemosphere* 4(1): 31-34; 1975. (8 references) (German)

Hydroxylated aglycones of phenylhydroxymethylurea - derived compounds were synthesized according to a method described by Pont, Jarczyk, Collet, and Thomas for methobenzthiazuron. These compounds were to be used for the characterization of the conjugates found or to be expected during the metabolosm of phenylurea herbicides. They were also needed for the identification of further terminal metabolites and for toxicologic studies on such metabolities. The hydroxylated aglycones, 3 - (4 - chlorophenyl) - 1 - methoxy - 1 - hydroxymethylurea and 3 - (4 - chlorophenyl) - hydroxymethylurea, were synthesized with formaldehyde in alkaline solution.

75-1653. Fournier, J. C. (Lab. de Microbiol. des Sols, I.N.R.A., Dijon, France). **Degradation microbiene de la 2,6-dichlorobenzamide dans des modeles de laboratoire. II - Influence de l'addition de substrats carbones simples sur la biodegradation de la 2,6-dichlorobenzamide. [Microbial degradation of 2,6-dichlorobenzamide in laboratory models. II. Influence of simple carbon-containing substrates on the biodegradation of 2,6-dichlorobenzamide.]** *Chemosphere* 4(1): 35-40; 1975. (4 references) (French)

The effect of simple hydrocarbon substrates on the microbial degradation of 2,6-dichlorobenzamide in soil suspensions and in soil was studied in the laboratory. The rate of metabolism was determined from the evolution of ^{14}C-labeled CO_2 from labeled pesticide. Both ethanol and glucose stimulated the microbial metabolism of 2,6-dichlorobenzamide in soil suspensions in which the metabolism was determined by the substrate supply. In solid media, i.e., soil samples, in which the diffusion and distribution of the substrate was limited, ethanol and glucose had no noteworthy effect on the rate of metabolism, while benzamide stimulated strains necessary for the degradation of 2,6-dichlorobenzamide. Benzamide increased the rate of metabolism threefold to over 25%/day due to co-metabolism. The metabolite was identified to be 2,6-dichlorobenzoic acid.

75-1654. Balasubramanian, A.; Kulkarni, J. H.; Reddy, H. R. R. (Radio-tracer Lab., Dept. Agric. Microbiol., Univ. Agric. Sci., Bangalore-24, India). **Influence of aldrin on radio-carbon (^{14}C-glucose) incorporation by two *Rhizobium* species.** *Curr. Sci. (India)* 44(3): 100-101; 1975. (4 references)

The effect of aldrin on the radiocarbon (^{14}C-glucose) assimilation in vitro by two species of *Rhizobium* is reported. *Rhizobium trifolli* from lucerne (*Medicago sativa* L.) and *Rhizobium* sp. from black gram (*Phaseolus mungo* var. *radiatus* Linn.) were grown in malt extract medium for 48 hr. Calculated quantities of aldrin were added to each flask so as to obtain 1 ppm (normal level) and 2 ppm. After incubation, 1 ml of an aqueous solution of radioactive (^{14}C)glucose was added to each flask. The percent distribution of radioactivity in the cellular fractions of the two rhizobia is tabulated. The total radioactivity incorporated into the whole cells increased significantly with the insecticide treatment in both the rhizobial species indicating a general increase in the carbon (^{14}C-glucose). Aldrin treatment altered the ^{14}C-glucose assimilation in different fractions of the cellular constituents of the two species of *Rhizobium* and the effect varied with the level of the insecticide.

75-1655. Iliff, N. A. (Shell Centre, London, S.E. 1, England). **Organic chemicals (except agricultural, animal health chemicals and food additives).** *IN: Environmental Quality and Safety, Vol. 2,* F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 64-71.

The effect of organic chemicals in the environment and the effect of chemical structure on biodegradability are discussed. A total amount of up to 20 million tons of manufactured organic chemicals may be entering the environment annually, out of a world total of about 60 million

tons of organic chemical produced. Organic pesticides account for about 1 million tons of the 20 million. Chemicals affect the environment in various ways depending on their nature, the way they are used, and the way in which they are disposed of after use. Specific examples of relationships between biodegradability and the chemical structure are presented for alkanes, alkenes, cyclohexane, chloro substituted alkanes, fatty acids, benzene, phenol, and nitrobenzene. Chlorine substituion in the benzene ring imparts some resistance to structures that would otherwise be more readily degradable. Some similar but more complete effects result from chlorine substitution in benzoic acid and phenoxy alkanoic acids. Resistance due to chlorine polysubstitution has been observed with both straight chain and ring structures as with organochlorine insecticides and chlorinated biphenyls.

75-1656. Roll, R. (Max-von-Pettenkofer-Inst. des Bundesgesundheitsamtes, Berlin. 33, Germany). **Toxicological evaluation of special organochlorinated compounds.** ***IN: Environmental Quality and Safety, Vol. 2,*** F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 117-124. (27 references)

A toxicological evaluation of organochlorine compounds including polychlorinated biphenyls and 2,4,5-T is presented. Toxicological studies on polychlorinated biphenyls are surveyed. The compounds are not used as biocides but they exhibit a mammalian toxicity which was detected recently in different species including the human being. Amounts of 3.5 ppm polychlorinated biphenyls and 3.8 ppm DDT and DDE were detected in human milk and 5.7 ppm polychlorinated biphenyls and 3.3 ppm DDT and DDE were detected in human fat. There is no hazard for pregnant women after ingestion of admissible 2,4,5-T residues in food despite evidence of its teratogenic effect. Considering the dose-effect relationships and the teratogenic no-effect level (which should be rated at approximately 20 mg/kg/day at present), a general ban on the use of herbicides containing 2,4,5-T is not necessary.

75-1657. Coulston, F. (Inst. Exp. Pathol. Toxicol., **Albany Med. Coll., Albany, NY 12208). Evaluating toxicological data as regards environmental significance.** ***IN: Environmental Quality and Safety, Vol. 2,*** F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 125-134.

The methodology used by the toxicologist to assess the safety of environmental chemicals is discussed using as examples the results of studies with methidathion and airborne lead particulates. Animal experiments using dosage levels sufficiently high to produce toxic effects are done to disclose target organs and systems, to establish the patterns of absorption, metabolism, excretion and/or storage, and to develop sensitive methods for monitoring these effects in man. Animal experiments with methidathion indicated that the red-blood cell cholinesterase level was the most sensitive indicator of exposure and possible toxic effect. Liver toxicity and elevation of serum SGPT levels in dogs, but not monkeys or rats, was a noteworthy species difference. Subsequent studies in man using levels higher than those to which the general population would likely be exposed demonstrated the safety of this compound. Blood levels in man and animals increased when exposed to airborne lead, and then reached an equilibrium in spite of continual exposure.

75-1658. Truhaut, R. (Centre de Recherches Toxicol., Fac. Sci. Pharm. Biol., Univ. Rene Descartes, Paris, France). **The problem of permissible limits of potentially toxic substances in the working and general environment of modern man.** ***IN: Environmental Quality and Safety, Vol. 2,*** F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 135-165. (47 references)

The development of permissible levels of potentially toxic substances in the working and general environment of modern man is discussed. Fixation of the toxicity threshold is the basis for establishing tolerable or admissible limits. There are three principal categories of risk: acute toxicity, chronic toxicity, and risks of ingestion of carcinogenic substances. Risks are evaluated by fixing the morphological and biochemical sites of attack and the establishment of relationships between doses and effects for the purpose of fixing toxicity thresholds. Pollutants are classified into three categories based on their toxic effects and the rapidity of their manifestation: substances whose primary effects are signs of irritation, sensitization, or acute intoxication caused by short term, immediate, or delayed exposure to concentrations of the type encountered in practice; substances involving cumulative effects caused by repeated exposure to concentrations usually encountered in practice. Suggestions include the concepts of time-weighted averages and threshold limit values for heavy metals and insecticides. The third category includes substances which are carcinogenic.

75-1659. Kenaga, E. E. (Agric. Dep., Dow Chem. Co., Midland, MI 48640). **Factors to be considered in the evaluation of the toxicity of pesticides to birds in their environment.** ***IN: Environmental Quality and Safety, Vol. 2,*** F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 166-181. (15 references)

The evaluation of pesticide toxicity to birds in their environment is discussed. The most useful toxicological unit for evaluating pesticides effects on birds is the milligrams of pesticide intake/kg of body wt/day. Body weights of birds can be estimated to within 20%. The upper limits of the amounts of residue of a pesticide in various species, shapes, and sizes of plant food and insects immediatley after application can be reasonably estimated. The upper limits of pesticide residues on plants and their decline with time on various types of crops as correlated from data on many pesticides are tabulated. A 1 lb/acre dosage of noncumulative pesticide could result in a 35-fold difference between maximum pesticide residues in different sized particles of natural bird food. Evaluation of the toxicity of pesticides in the food of birds is most realistic if the results of subacute or chronic dietary feeding studies are available.

75-1660. Rashid, S.; Roohi, R. A.; Naqvi, S. N. H. (Inst. Physiol. Chem., Marburg, Germany). **Characterization of acid phosphatase and its relation with insecticide metabolism in *Bruchus chinensis* (Linnaeus).** *IN: Environmental Quality and Safety, Vol. 2,* F. Coulston and F. Korte, eds., Academic Press, New York, 1973, p. 209-218. (61 references)

The characterization of acid phosphatase and its relation with insecticide were determined in *Bruchus chinensis* (L.) and optimum factors are reported. Optimum pH was 4.0, Km value 0.0125 *M*, and an optimum temperature was 41°C for a 30 min incubation period. On the basis of the probit mortality curves, 0.01% concentration of Petkolin and phosalone and 0.1% concentration of Ovex were prepared and 1.2 microliter dose was topically applied over the prothorax of each *Bruchus*. Enzyme activity decreased by in vivo treatment with Ovex and Petkolin, while it increased with phosalone. The rate of respiration increased with increase of insecticide concentration at 1 hr with Petkolin and phosalone (more toxic) and even at 3-hour intervals in the case of Ovex (less toxic) insecticide. At 24-hour intervals it decreased with increasing concentration in the case of Petkolin and phosalone, while not in the case of Ovex. Metabolic reactions have some correlation with the toxicity of the insecticides while changes in the phosphatase level are under different genetic controls and depend on some other biochemical reaction.

75-1661. Prigge, E. (Inst. Pharmakol., Toxikol. Pharm., Tieraerztliche Hochschule, Hanover, Germany). **Uebersichtsreferat: Umwelttoxikologische Aspekte der Anwendung von Insektiziden und Herbiziden. [Environmental toxicological aspects of the use of insecticides and herbicides. A review.]** *Deut. Tieraerztl. Wochenschr.* 80(21): 511-513; 1973. (25 references) (German)

General environmental and toxicological aspects of herbicides are described. Most herbicides are considerably less toxic to the warm-blooded organism then insecticides, and almost all herbicides are subject to microbial degradation in the soil within a few weeks, while some other substances are persistent for 1 to 2 years. Herbicides, except for fatty acid-derived preparations, are rapidly broken down in plants. Therefore, and because herbicides are usually applied long before harvesting, their residues in plants are usually very low. Residues of defoliants and desiccants, applied shortly before harvesting, are an exception, however. Herbicides usually have low chronic toxicity. The no-effect levels were determined to be 500 ppm for dicamba, 5,000 ppm for barban, and 300 ppm for pyrazon, while the residue levels of these pesticides in plants as harvested are usually below 0.1 ppm. The maximum allowable concentration of dalapon is 26 ppm. Aminotriazole, DNOC, and diquat may cause residue problems. Zero tolerance is required for aminotriazole in plants.

75-1662. Skryabin, G. K.; Golovleva, L. A.; Solov'eva, T. F. (Inst. Biochem. Physiol. Microorganisms, Acad. Sci. USSR, Pushchino-na-Oke, USSR). **Sookisleniye fenoksialkanovykh kislot mikrobnymi kul'turami. [Cooxidation of phenoxyalkanoic acids by microbial cultures.]** *Dokl. Akad. Nauk SSSR* 215(2): 454-456; 1974. (5 references) (Russian)

The effect of 2,4-D, MCPA, and ordram (molinate) on soil microorganisms, and the cooxidation of these pesticides by such soil microorganisms were studied. The pesticides caused considerable quantitative and qualitative changes in the microorganism populations. None of the microorganisms was found to utilize the pesticides as a sole source of carbon. However, 60% of all species of soil microorganisms metabolized (oxidized) the pesticides when cultured in *n*-hexadecane, glucose, and organic acids as carbon sources. The initial phenoxyalkanoic acids were transformed to partially oxidized metabolites with the aromatic ring remaining intact. The enzymatic reactions resulted in oxidative cleavage of aliphatic fragments composed of two carbon atoms with formation of glyoxylic acid, in the introduction of a hydroxyl group into the nucleus, and in the oxidation of methane to carbonyl. *Arthrobacter, Brevibacterium,* and *Nocardia* species were most active.

75-1663. Lowndes, H. E.; Baker, T.; Riker, W. F. Jr. (Dep. Pharmacol., New Jersey Med. Sch., Newark, NJ 07103). **Motor nerve terminal response to edrophonium in delayed DFP neuropathy.** *Eur. J. Pharmacol.* 30(1): 69-72; 1975. (9 references)

A localized peripheral neuropathy was induced in adult male and female cats with di-isopropyl fluorophosphate (DFP, given intra-arterially). Soleus nerve-muscle preparations, and the motor nerve terminals in particular, were evaluated for responsiveness to edrophonium (200 μg/kg, i.v.). Potentiation of contractile strength was absent 24 hr after DFP treatment, and showed a trend toward recovery 7-14 days post-DFP; it then fell to about 25% of normal 3 weeks following DFP administration. During the ensuing 5 weeks, this aspect of edrophonium responsiveness was largely regained. The underlying post-drug repetition which gives rise to the potentiated responses was not demonstrable in either the nerve or muscle 3 weeks after DFP, but was again observed 8 weeks after poisoning. These findings suggest a delayed peripheral neuropathy indicative of a trophic deprivation and further illustrate a motor nerve terminal deficit as the initial function alteration in DFP neuropathy.

75-1664. Nickolson, V. J.; Clason-Van der Weil, H. J.; Wolthuis, O. L. (Med. Biol. Lab. TNO, Rijswijk, The Netherlands). **Further studies on the therapy of organophosphorus anti-cholinesterase intoxication with veratrinic compounds; the role of calcium.** *Eur. J. Pharmacol.* 30(2): 188-196; 1975. (14 references)

The role of calcium in the 9-anthroic acid (ANCA, a compound with veratrine-like pharmacological properties) therapy of soman intoxication was studied. The effects of ANCA on the respiratory paralysis and the calcium content of the blood and hindleg muscles were determined

using anesthetized, atropinized male Wistar rats injected i.v. with 4 times the LD50 of soman. The respiratory paralysis, which in control animals occurred within a few min after soman treatment, was delayed about 2.5 hr by i.v. ANCA injection. ANCA caused a small decrease in the blood calcium content, an effect which was potentiated by soman. Soman or ANCA alone caused no change in the accumulation of calcium in the indirectly stimulated gastrocnemius-soleus muscles, while the two drugs combined induced a 2-fold increase in calcium accumulation in the stimulated muscles; the nonstimulated muscles on the other side remained unaffected. The accumulation of calcium in the stimulated muscles could be partially antagonized by lowering the free calcium concentration in the blood by EDTA injection. EDTA also improved the therapeutic effects of ANCA. ANCA therapy of soman poisoning appears to be less than totally effective in preventing respiratory failure.

75-1665. Sram, R. (Inst. Hyg. Epidemiol., Prague, Czechoslovakia). **Izucheniye i otsenka geneticheskoy opasnosti khimicheskikh veshchestv. [Evaluation of the genetic danger of chemical substances.]** *Gig. Sanit.* 4: 80-83; 1974. (10 references) (Russian)

Interim results of mutagenicity tests being carried out on drugs, industrial chemicals, and pesticides at the Institute of Hygiene and Epidemiology in Prague, Czechoslovakia, are reviewed. *Drosophila malanogaster* and mice are used for the mutagenicity tests. The pesticide fenitrothion (metathion) was found to exert no mutagenic effects at all over several consecutive generations. Certain organochlorine pesticides, such as DDT and heptachlor, were found to cause chromosomal mutations in similar experiments.

75-1666. Cenci, P.; Cavazzini, G. (Ist. Igiene, Univ. Ferrara, Ferrara, Italy). **Effetti della monofluoroactammide (MNFA) sulla microflora dell'ambiente. Nota III. Influenza della MNFA sui batteri che intervengono nei cicli naturali dello zolfo, del fosforo e del ferro. [Effects of monofluoroacetamide (MNFA) on the microflora. III. Effects of MNFA on sulfur, phosphorus, and iron natural cycles.]** *Ig. Mod.* 66(2): 131-149; 1973. (20 references) (Italian)

The interaction is presented between *N*-methyl-(*N*-1-naphthyl)monofluoroacetamide and bacteria which fulfill fundamental biochemical functions in the sulfur, phosphorus, and iron natural cycles. The following are reported: oxidation of sulfur to sulfate (*Thiobacillus thiooxidans* and *Th. thioparus*); oxidation of thiosulfate to sulfur (*Thiobacillus thiooxidans*); growth of *Desulfovibrio desulfuricans* and reduction from sulfate to sulfide; growth of *Bacillus megatherium* var. *phosphaticum* and *Bacillus cereus*, and organic phosphorus solubilization; growth of *Ferrobacillus ferrooxidans* and iron oxidation. MNFA shows a toxic action on aerobic microorganisms, while it seems that the action of anaerobic bacteria is either a stimulating effect (at the higher concentrations of MNFA) or a toxic one (at the lower concentrations).

75-1667. Cenci, P.; Cavazzini, G. (Ist. Igiene, Univ. Ferrara, Farrara, Italy). **Effetti della monofluoroacetammide (MNFA) sulla microflora dell'ambiente. Nota IV. Effetti della MNFA su alcuni microorganismi acquatici. [Effects of monofluoroacetamide (MNFA) on the microflora. IV. Effects of MNFA on aquatic microorganisms.]** *Ig. Mod.* 66(3): 217-285; 1973. (11 references) (Italian)

The effects are presented of *N*-methyl-(*N*-1-naphthyl)monofluoroacetamide (MNFA) on bacteria and algae chemically active in fresh, saline, and waste waters. By spectrophotometry, growth and essential biochemical functions were determined in *Methanococcus vannielii* (CH_4 production); *Sphaerotilus natans* and *Leptothrix cholodnii* (iron precipitation); *Photobacterium phosphoreum* (luminescent energy emission); *Chlorella vulgaris*, *Euglena viridis*, *Anabaena cylindrica* and *Nostoc muscorum* (chlorophyll *a* production). Results show that MNFA develops a toxic action on all the aerobic microorganisms considered. Chlorophyll production whether on Chlorophyceae or Cianophyceae, seems to be inhibited. *Methanococcus vannielii* behavior corroborates the hypothesis that an antagonism exists between stimulation (probably due to a mechanism of hydrogen donation) and toxicity in anaerobic reducing microorganisms.

75-1668. Makhija, S. J.; Pawar, S. S. (Biochem. Div., Dept. Chem., Marathwada Univ., Aurangabad, India). **Effect of insecticide Take-20 (*O,O*-dimethyl-malathion) [sic] on hepatic drug metabolism and lipid peroxidation in young growing rats.** *Indian J. Biochem. Biophys.* 11(3): 266-268; 1974. (14 references)

Take-20, a common household organophosphorus insecticide, was administered by injection to 25 Charles-Fortel strain young male rats. The effect on the in vitro metabolism of aminopyrine and ethylmorphine (type I), aniline and acetanilide (type II) and reduced NADP-linked lipid peroxidation was studied. Body weights were decreased on treatment with Take-20 injections. However, they were slightly increased with phenobarbital administration. The increase in body weights was more significant when phenobarbital was administered to Take-20 injected animals. Liver weights did not show significant change due to Take-20 injections, however, phenobarbital administration resulted in a characteristic liver enlargement. The aminopyrine *N*-demethylase activity was slightly stimulated by Take-20. The percent increase by phenobarbital alone was 54.9%. However, when phenobarbital was administered to Take-20 animals, the percentage increase in aminopyrine *N*-demethylase was raised to 69.0%. Ethylmorphine *N*-demethylase activity was also increased by 41.5% due to Take-20 injections. The percentage increase in activity was 51.6% when the animals were treated with phenobarbital alone. Treatment of Take-20 animals with phenobarbital caused an increase from 41.5 to 86.9% in ethylmorphine *N*-demethylase. Increases in aniline and acetanilide hydroxylase activities were 12.0 and 25.7%, respectively, in Take-20 animals. Phenobarbital alone increased these activities by 40.0 and 35.5%. However, the

percentage increases were 48.0 and 43.0% in the hydroxylation of aniline and acetanilide when the Take-20 animals were pretreated with phenobarbital. The reduced NADP-linked peroxidation was increased by 23.0% due to Take-20 injections. Phenobarbital treatment alone resulted in a decrease in lipid peroxidation by 32.7%. However, phenobarbital administration to Take-20 injected animals could decrease lipid peroxidation by 23.0%. These results indicate a slight stimulation in the microsomal oxidation during acute treatment of Take-20. It appears that this observed stimulation may be due to the addition of two methyl groups. It is likely that the in vivo metabolism in dimethylmalathion to malaoxon, a potent enzyme inhibitor, may be slow compared to malathion which could change the enzyme activities. The fact that phenobarbital injections did show their characteristic stimulation of liver growth, protein content, and the activity of drug enzymes, indicates that the acute treatment with Take-20 could not inhibit the phenomenon of induction by phenobarbital. The enhanced reduction of NADP-linked lipid peroxidation indicates that the acute treatament of Take-20 stimulates the activity of liver microsomal enzymes and lipid peroxidation.

75-1669. Livens, J. (Fak. Landbouwwet., Katholieke Univ. Leuven, Louvain, Belgium). **La nitrification dans les sols traites aux pesticides, en culture betteraviere.** [**Nitrification of soils treated with pesticides in sugar beet cultivation.**] *Inst. Belge Amelior. Betterave Publ.* 4: 143-149; 1973. (6 references) (French, Flemish)

The effect of diallate, cycloate, pyrazon, lenacyl, phenmedipham, aldrin, aldicarb, prophos, and heptachlor on the nitrification of urea in the soil was studied under laboratory conditions. All pesticides suppressed the nitrification of urea more or less markedly for about 2 weeks when used in doses corresponding to triple the normal dose used in practice, while they had but slight effect on the nitrification of the soil organic nitrogen. Phenmedipham, diallate, and pyrazon were most powerful as nitrification inhibitors. Phenmedipham and diallate suppressed the nitrification even when used in normal dose.

75-1670. Agabekyan, R. S.; Berkhamov, M. Kh.; Godovikov, N. N.; Kabachnik, M. I.; Ol'khovaya, G. G. (Inst. Heteroorg. Compounds, Acad. Sci. USSR, Moscow, USSR). **Zintez i vzaimodeystviye s atsetilkholinesterazoy nekotorykh *S*-alkildifeniltiofosfinatov.** [**Synthesis and interaction with acetylcholinesterase of certain *S*-alkyldiphenylthiophosphinates.**] *Izv. Akad. Nauk SSSR Ser. Khim.* 2: 407-411; 1974. (9 references) (Russian)

The synthesis and the interaction with acetylcholinesterase of certain *S*-alkyldiphenylthiophosphinates are described. The *S*-alkyldiphenylthiophosphinates were synthetized by the alkylation of sodium diphenylthiophosphinate with corresponding bromine alkyls. The synthetized compounds were found to be able to inhibit the acetylcholinesterase both reversibly and irreversibly, depending essentially on the length and the degree of branching of the alkyl radical of the alkylthiol group. For compounds containing non-branched alkyl radicals, causing irreversible inhibition, the inhibition constant *ka* increased by 26 times with the increase of the length of the alkyl radical from methyl to hexyl. In organophosphorus acetylcholinesterase inhibitors containing alkyl radicals of normal structure, the substitution at the phosphorus atom of the methyl and ethoxy groups by two phenyl groups weakens the effect of the alkylthiol radical on the irreversible inhibitory activity. In analogous organophosphorus compounds with branched-off alkyl radicals, such substitution causes a sharp decrease in the cholinesterase-inhibiting activity.

75-1671. Agabekyan, R. S.; Bekanov, M. Kh.; Berkhamov, M. Kh.; Godovikov, N. N.; Kabachnik, M. I. (Inst. Heteroorg. Compounds, Acad. Sci. USSR, Moscow, USSR). **Vzaimodeystviye *O* - etil - *O* - (beta - alkylmerkaptoetil) - fenilfosfonatov i *O*-alkyl - *O* - (beta - metilmerkaptoetil) - fenilfosfonatov s kholinesterazami.** [**Reaction of *O* - ethyl - *O* - (β - alkylmercaptoethyl)phenylphosphonates and *O* - alkyl - *O* - (β - methylmercaptoethyl)phenylphosphonates with cholinesterases.**] *Izv. Akad. Nauk SSSR Ser. Khim.* 4: 874-877; 1974. (5 references) (Russian)

The interaction of *O* - ethyl - *O* - (β - alkylmercaptoethyl)phenylphosphonates and *O* - *alkyl* - *O* - (β - methylmercaptoethyl)phenylphosphonates with acetylcholinesterase and butyryl cholinesterase was studied. While both types of compounds reversibly inhibited the cholinesterase activities, both types were more active with respect to butyryl cholinesterase than with respect to acetylcholinesterase, which may be due to the increased tendency of butyryl cholinesterase to hydrophobic interactions compared with acetylcholinesterase. In the interaction of *O* - ethyl - *O* - (β - alkylmercaptoethyl)phenylphosphonates with butyryl cholinesterase, the value of the *ki* constant increased continuously with the transition from methyl to hexyl radical. For the interaction with acetylcholinesterase, the inhibition constant decreased from the methyl to the butyl derivative. The inhibiting action of the two different types of inhibitors was a function of the length of the alkyl radical linked with the sulfur and oxygen atoms.

75-1672. Silberstein, G. B.; Hooper, A. B. (Dep. Biol. Sci., Univ. California, Santa Barbara, CA 93106). **The effect of the herbicide 2,4,5-trichlorophenoxy acetic acid (245T) on the growth and metabolism of *Tetrahymena pyriformis*.** *J. Cell. Physiol.* 85(2): 331-338; 1975. (25 references)

Cultures of *Tetrahymena pyriformis*, a micronucleate strain ST, were incubated with 2,4,5-T and the effect of the herbicide on growth, oxygen consumption, mitochondrial oxygen utilization, and cell structure and composition determined. 2,4,5-T in concentrations of 0.5 to 0.9 m*M* inhibited respiration and then growth in the exponentially growing cultures. Cell division was stopped for periods up to 60 min, after which the cells recovered and division resumed. Recovery of oxygen utilization and

cell division also occurred in the presence of the herbicide. 2,4,5-T also inhibited mitochondrial oxygen utilization in the cultures. Mitochondria from cells which had recovered from herbicide trmeatment lost their sensitivity to low concentrations of the chemical and sedimented deeper in a sucrose gradient than mitochondrial from control cells. The growth pattern produced by 2,4,5-T in *Tetrahymena* appears to be illustrative of the inhibition of cell division via the inhibition of ATP synthesis.

75-1673. Miller, R. W.; Corley, C.; Hill, K. R. (U. S. Dep. Agric., Beltsville, MD 20705). **Feeding TH 6040 to chickens: effect on larval house flies in manure and determination of residues in eggs.** *J. Econ. Entomol.* 68(2): 181-182; 1975. (6 references)

Mature New Hampshire and White Leghorn laying hens were maintained on commercial rations containing TH 6040 (*N* - (4 - chlorophenyl) - *N'* - (2,6 - difluorobenzoyl)urea). The insecticide was incorporated into the ration at levels of 50 ppm during the first 3 weeks and at steadily decreasing levels during the following 3 week periods; the concentration during the final 3-week period was 1.6 ppm. Composite manure samples taken from treated and control hens were seeded with house fly larvae and the development of the larvae determined; eggs were also taken from the treated birds and subjected to residue analysis. At 1.6 ppm, the fly pupae exhibited the characteristically disrupted cuticle formation, an effect which was more pronounced at 3.1 ppm. At the latter concentration, 83% of the larvae were killed, while at 12.5 ppm, all of the larvae seeded into the manure were killed. All eggs from the treated birds contained TH 6040 residues, the residue levels in the white eggs being twice as high as in the brown eggs. The use of TH 6040 as a feed additive for fly control will depend on the production of formulations which will cause a greater proportion of the material to pass through the chicken without being absorbed.

75-1674. Statham, C. N.; Lech, J. J. (Dep. Pharmacol., Med. Coll. Wisconsin, Milwaukee, WI 53233). **Metabolism of 2',5-dichloro-4'-nitrosalicylanilide (Bayer 73) in rainbow trout (*Salmo gairdneri*).** *J. Fish. Res. Bd. Can.* 32(4): 515-522; 1975. (26 references)

Uptake, metabolism and elimination of 2',5 - dichloro - 4' - nitrosalicylanilide (Bayer 73) was studied in rainbow trout (*Salmo gairdneri*) exposed to ^{14}C bayer 73 in water. Transfer of trout to fresh water after exposure to Bayer 73 for 12 hr resulted in the disappearance of ^{14}C from most tissues after 48-72 hr. A 24-hr ^{14}C bile to water ratio of 10,000:1 indicated a high degree of biliary concentration. A single polar ^{14}C metabolite was purified from bile. Analysis by analytical thin-layer chromatography, β - glucuronidase hydrolysis, acid hydrolysis, infrared spectroscopy, and mass spectrometry indicated that the material was the glucuronide conjugate of Bayer 73. (Author abstract by permission)

75-1675. Ito, N.; Nagasaki, H.; Aoe, H.; Sugihara, S.; Miyata, Y.; Arai, M.; Shirai, T. (First Dep. Pathol., Nagoya City Univ., Med. Sch., Nogoya, Japan). **Development of hepatocellular carcinomas in rats treated with benzene hexachloride.** *J. Natl. Cancer Inst.* 54(3): 801-805; 1975. (23 references)

Male Wistar rats were maintained on basal diets containing 500-1500 ppm α-BHC, β-BHC, γ-BHC, or δ-BHC, and the effects on the liver determined histologically. In general, the BHC-treated rats, especially those given the α-isomer, weighed less than the controls. In contrast, the liver weights of the BHC-treated animals, particularly those receiving the α-isomer, were greater than those of the controls. Well-differentiated hepatocellular carcinomas were observed in the livers of the rats fed 1000 or 1500 ppm α-BHC for 72 weeks; all animals fed these concentrations of the α-isomer developed typical nodular hyperplasias. In non-neoplastic areas, slight oval cell infiltration and bile duct proliferation were seen. No neoplastic changes or other histological abnormalities (fatty changes, fibrosis, bile duct proliferation of the liver) were found in the animals fed 500 ppm α-BHC or any of the other isomers. No remarkable changes were noted in any organ besides the liver in any animal.

75-1676. Smith, P.; Heath, D. (Dep. Pathol., Univ. Liverpool, Liverpool, England). **The ultrastructure and time sequence of the early stages of paraquat lung in rats.** *J. Pathol.* 114(4): 177-184; 1974. (10 references)

The ultrastructure and time sequence of the early stages of paraquat intoxication were investigated in female albino Wistar rats. Each test rat received a dose of 40 mg paraquat ion/kg body weight. The animals were killed sequentially so that the pathogenesis of pulmonary changes could be examined with an electron microscope. The earliest changes occurred after 4 hr and consisted of an increased metabolic activity and thickness of membranous pneumocytes. By 8 hr there was cytoplasmic edema of both membranous and granular pnuemocytes. The alveolar epithelium showed hydropic degeneration at 18 hr, and disintegrated 2 days after injection. There was a pronounced intra-alveolar infiltrate of cells on the fourth day. The cells were replaced by mature fibroblasts and intermediate forms were observed.

75-1677. Warner, R. W. (Natl. Field Investigations Center, EPA, Denver, CO). **Water pollution: freshwater** macroinvertebrates. *J. Water Pollut. Control Fed.* 46(6): 1341-1350; 1974. (101 references)

Research studies on the effect of biocides on aquatic organisms are summarized. The studies include: DDT and polychlorinated biphenyls uptake and excretion in mayfly nymphs; retention of body water by pulmonate snails in the presence of aldrin; tolerance of five invertebrate species to mirex; naled toxicity in hellgramites and stoneflies; effect of chlorpyrifos on pond life and on chironomine midges; and toxicity of frescon on aquatic organisms in a lake. The toxicity of 14 herbicides to 13 animal species was determined. The herbicides were divided into three groups based on toxicity: powerfully toxic carbamates and

phenols; moderately toxic phenoxyacetic acid derivatives; and slightly toxic inorganics and chlorated organics.

75-1678. Brantsevich, L. G.; Gubrik, A. V.; Taran, F. I. (Kiev State Univ., Kiev, USSR). **Vliyaniye metilmerkaptofosa na azotfiksiruyushchiye bakterii rizosfery khmelya. [Effect of methylmercaptophos on nitrogen-fixing bacteria of the rhizosphere of hops.]** *Khim. Sel. Khoz.* 12(1): 35-37; 1974. (6 references) (Russian)

The effect of methylmercaptophos on aerobic and anaerobic nitrogen-fixing bacteria in the rhizosphere of hops was studied. Methylmercaptophos doses of 1 to 3 g per plant did not suppress the growth of aerobic nitrogen-fixing bacteria, while doses of 4 to 5 g per plant reduced the bacterial population. The anaerobic nitrogen-fixing bacterium *Cl. pasteurianum* was more susceptible to methylmercaptophos than aerobic species. It was depressed by all doses applied during the initial period after pesticide application.

75-1679. Butler, C., II. (Dep. Pathol., Univ. Arizona, Sch. Med., Tucson, AR 85724). **Modification of paraquat injury in hamsters.** *Lab. Invest.* 28(2): 379; 1973.

The possibility of hypersensitivity to paraquat was investigated with male hamsters who were given eight weekly injections. Of these, 24 also received adrenocorticotrophic hormone (ACTH) twice weekly at the same time, 24 received the initial paraquat injection in complete Freund's adjuvant, and 13 controls received only paraquat. Steroid only and adjuvant only controls were also used. One month after after final injection, all animals were sacrificed. Concurrent ACTH administration and initial adjuvant administration clearly reduced the extent of fibrosis created by paraquat (p is less than 0.01). The ACTH but not adjuvant also appeared to lessen the weight which accompanies paraquat toxicity in these animals. The amelioration of paraquat injury by ACTH is somewhat contrary to previous data and probably reflects general anti-inflammatory steriod effect. No evidence was found that hypersensitivity to paraquat is an important pathogenetic mechanism in the lung injury.

75-1680. Hartman, H. A. (Biol. Res. Dep., Sandoz-Wander, Inc., East Hanover, NJ 07936). **Status-mutagenicity and teratogenicity screening requirements for evaluation of new pharmaceuticals, pesticides, food additives, and other chemical products.** *Lab. Invest.* 28(3): 385-386; 1973.

The status of mutagenicity and teratogenicity screening requirements for the evaluation of new pesticides is discussed. There are serious limitations to the use of these mutagenic tests; host-mediated assay, cytogenic evaluation, and dominant lethal test. The nature and degree of biologic variation peculiar to each test system is unknown, experience in using them is lacking in most laboratories, and comparatively few substances are evaluated. Animal experiments in teratologic testing defined as minimal requirements were established by regulatory agencies and followed by industry for detection of adverse effects upon the reproductive process and embryologic development for the past 6-10 yr. A thorough critical reappraisal of these requirements and testing procedures is needed with active participation by representatives of industry, regulatory agencies, and academic groups.

75-1681. Green, M. H. L.; Medcalf, A. S. C.; Arlett, C. F.; Harcourt, S. A.; Lehmann, A. R. (MRC Cell Mutation Unit, Univ. Sussex, Falmer, Brighton, England). **DNA strand breakage caused by dichlorvos, methyl methanesulphonate and iodoacetamide in *Escherichia coli* and cultured Chinese hamster cells.** *Mutat. Res.* 24(3): 365-378; 1975. (30 references)

The DNA damaging properties of dichlorvos (2,2-dichlorovinyl dimethyl phosphate), methyl methanesulphonate (MMS) and iodoacetar ıde (IAA) have been studied, using alkaline sucrose sedimentation. In a strain of *E.coli* deficient in DNA polymerase I (*polA*) both dichlorvos and MMS caused random strand breakage, MMS being about twice as efficient as dichlorvos on a molar basis. In *pol*+ bacteria, DNA strand breaks or alkali labile bonds were detected following treatment with roughly five-fold higher concentrations of MMS but at similar high concentrations of dichlorvos there was an all or none breakdown of DNA molecules to fragments of very low molecular weight which correlated well with lethality. DNA synthesized after treatment of *pol*+ and *polA* bacteria with MMS was of low molecular weight, indicating the presence of discontinuities. With dichlorvos, the effect was much smaller. Apparent all-or-none DNA breakdown was also found when the *polA* strain of *E. coli* was treated with low concentrations of iodoacetamide, an agent that does not detectably alkylate DNA. At higher concentrations the breakdown was suppressed and random strand breakage occurred instead. These effects did not occur with *pol*+ bacteria and correlated well with the greater sensitivity to iodoacetamide of the *polA* strain in survival experiments. We suggest that the major DNA damage resulting from treatment with iodoacetamide and dichlorvos arises indirectly through alkylation of other cellular constituents and consequent uncontrolled nuclease attack on the DNA. Discontinuities in newly synthesized DNA and mutagenesis following dichlorvos treatment, however, presumably result from direct alkylation of DNA. Strand breakage caused by dichlorvos and MMS in Chinese hamster cells tended to correlate with the extent to which these agents alkylate DNA, but survival tended to correlate with the alkylation of protein. (Author abstract by permission)

75-1682. Pasi, A.; Embree, J. W., Jr. (Toxicol. Activ., Dep. Pharmacol., Univ. California, San Francisco, CA 94143). **Further comments on the assessment of the mutagenic properties of diquat and paraquat in the murine dominant lethal test.** *Mutat. Res.* 31(2): 123-125; 1975. (9 references)

Comments on the assessment of the mutagenic properties of diquat and paraquat in the murine dominant lethal test are presented in a letter to the editor in which

aspects of the experimental design and presentation of data are explained. All male mice (Swiss-Webster) were proven fertile by producing at least one pregnant female mouse prior to being used in the dominant lethal test. Sample sizes were similar to those used in similar studies and were statistically calculated to meet the scope of the experiment. Factors to consider in testing herbicides and pesticides include not only the extent of use, but also pattern of usage and modalities of exposure of the involved human populations. In the case of diquat and paraquat, except for eposides of suicidal and accidental ingestions or of occupational exposures, there is virtually no risk that the human population would be significantly exposed to the herbicides through such environmental vectors as food and water. The study did not try to prove that diquat and paraquat are non-mutagenic, but that they did not induce significant mutagenic effects on the spermatogenesis of mice at the doses used.

75-1683. Ware, R. A.; Chang, L. W.; Burkholder, P. M. (Dep. Pathol., Univ. Wisconsin Med. Sch., Madison, WI 53706). **Ultrastructural evidence for fetal liver injury induced by in utero exposure to small doses of methylmercury.** *Nature (London)* 251(5472): 236-237; 1974. (16 references)

The first ultrastructural demonstration of fetal liver injury induced by maternal exposure early in gestation to small doses of methylmercury is reported. Twenty-four pregnant female Sprague-Dawley rats were divided into four groups of six rats each. Methylmercuric chloride was injected subcutaneously into groups 1, 2, and 3 in respective doses of 0.5, 0.75, and 1.0 mg on the ninth day of their gestational cycle. The fourth group was the control group. Neurological symptoms were not observed in pregnant rats and no gross teratological malformations were noted in any of their offspring. The livers of the fetuses presented a consistent dose-dependent pattern of liver injury including: mitrochondrial degeneration, lipid droplets, and dilatation of endoplasmic reticulum.

75-1684. Peakall, D. B.; Miller, D. S.; Kinter, W. B. (Cornell Univ., Ithaca, NY 14850). **Prolonged eggshell thinning caused by DDE in the duck.** *Nature (London)* 254(5499): 421; 1975. (6 references)

Changes in eggshell thickness in the White Peking duck (a domesticated mallard) during 27 wk following a brief exposure to dietary DDE is reported. Three 6-month old ducks were fed 250 ppm DDE for 10 days and then control-duck feed for the rest of the experiment. A rough calculation from the rate of food consumption shows that experimental ducks (body wt 5-6 kg) ingested about 0.5 g DDE. Eggshells from ducks fed DDE were approximately 20% thinner than controls. Recovery of shell thickness was slow, being less than half-way at the end of 27 wk. Initial residue levels in the yolks were greater than 150 ppm. After 27 wk residue values declined only to about 90 ppm. Levels of DDE in residues in a control egg yolk were 0.23 ppm. It was calculated that roughly 0.2 g DDE or 40% of the original dose would be lost through the eggs.

75-1685. Agarwal, H. C.; Gupta, B. (Dep. Zool., Univ. Delhi, Delhi-7, India). **Distribution and metabolism of DDT in the catfish *Heteropneustes fossilis* in relation to the signs of poisoning.** *Toxicol. Appl. Pharmacol.* 29: 204-209; 1974. (22 references)
75-1618

Adult male catfish, *Heteropneustes fossilis* (Bloch), were given a lethal dose of 800 mg DDT/kg as an i.m. injection of 10% *p,p'*-DDT in peanut oil (w/v) in the caudal region. The metabolites of DDT in various tissues were studied 24 hr after treatment. For DDT distribution studies, the treated animals were divided into 6 categories according to signs of poisoning: (1) no signs, (2) hyperexcitation, (3) tremors, (4) convulsions, (5) death, and (6) recovery. The concentration of DDT was determined in brain, spinal cord, liver, kidney, and fat. Adequate replicates and controls were used in each case. *p,p'*-DDE was the only metabolite detected. The major proportion of DDE (10%) was found in the kidney, while liver and fat bodies contained slightly lesser amounts of DDE. The remainder was unchanged DDT. The concentration of DDT in the tissues increased with time and the severity of poisoning. The brain and spinal cord contained the lowest concentration of DDT, starting with 7.1 and 9.8 ppm when the fish showed no signs. The DDT content gradually rose to 50.5 and 58.7 ppm when the fish were dead, and declined to 9.1 and 19.0 ppm in fish which recovered completely. In fat, the DDT content continued to increase steadily and was maximal in fish which had recovered. The results indicate that signs of poisoning in the catfish were directly related to the concentration of DDT in brain and spinal cord. The concentrations of DDT in brain and spinal cord of the catfish soon after death were similar to those found in some other vertebrates, e.g., rats, mice, and a few species of birds, under identical circumstances. (Author abstract by permission)

75-1686. Blair, D.; Hoadley, E. C.; Hutson, D. H. (Tunstall Lab., Shell Res. Ltd., Sittingburne Res. Cent., Sittingbourne, England). **The distribution of dichlorvos in the tissues of mammals after its inhalation or intravenous administration.** *Toxicol. Appl. Pharmacol.* 31(2): 243-253; 1975. (19 references)

No dichlorvos could de detected in the blood of rats, mice, and humans after exposure to atmospheric concentrations of dichlorvos up to 17 times that normally attained for domestic insect control. Exposure of rats to 10 μg/liter (250 times normal exposure) for 4 hr was required before dichlorvos was found present; it was then measurable only in the kidneys of the animals. At about 90 μg/liter (2000 times normal exposure) dichlorvos could be detected in most tissues of the rat. The latter dichlorvos concentration is slightly more than 60% of full saturation of air at ambient conditions. The half-life of dichlorvos in the kidneys of male rats exposed to approximately 50 μg/liter for 4 hr was 13.5 min, indicating rapid degradation. Dichlorvos administered i.v. to rats was rapidly distributed, as it was following inhalation exposure. When mice were exposed to the high atmospheric concentrations of dichlorvos, the

compound could be detected in most of the tissues examined, but male mouse kidneys contained only one-tenth of that found in male rat kidneys. In vitro, addition of dichlorvos to blood of rats, rabbits, and humans similarly revealed a rapid degradation which was catalyzed by enzymes in the plasma.

75-1687. Benke, G. M.; Murphy, S. D. (Dep. Physiol., Kresge Centre for Environ. Health, Harvard Univ. Sch. Pub. Health, Boston, MA 02115). **The influence of age on the toxicity and metabolism of methyl parathion and parathion in male and female rats.** *Toxicol. Appl. Pharmacol.* 31(2): 254-269; 1975. (31 references)

To determine the mechanisms responsible for the variations in toxicity of methyl parathion and parathion, the in vitro metabolism of these insecticides and cholinesterase sensitivity to their respective oxygen analogs methyl paraoxon and paraoxon were studied in male and female rats of several ages. For rats of five ages studied (1, 12-13, 23-24, 35-40, and 56-63 days), there was a gradual decrease in susceptibility to poisoning by both insecticides with increasing age up to 35-40 days for both sexes. Age differences in susceptibility were not related to differences in sensitivity of cholinesterase to inhibition by paraoxon or methyl paraoxon in vitro. Oxidative formation of the oxygen analogs, oxidative aryl cleavage, and glutathione-dependent dealkylation and dearylation of methyl parathion and parathion were assayed in liver homogenates of male and female rats of the five ages. Rates of enzymatic detoxification of their corresponding oxygen analogs by A-esterase, glutathione-*S*-aryl-, and -*S*-alkyl-transferase and inactivation by binding were also investigated. Correlation coefficients for rates of metabolism versus LD50 values for the different ages were calculated. In general, changes in LD50 values for the different ages were calculated. In general, changes in LD50 values with age for methyl parathion and parathion correlated better with changes in rates of reactions which represented detoxification pathways for methyl paraoxon and paraoxon than for reactions which represented direct metabolism of the parent insecticides. Both male and female rats became much less sensitive to the acute lethal effects of methyl paraoxon and paraoxon with increasing age. This is consistent with a hypothesis that changes in LD50 values of methyl parathion and parathion with age are due to changes in rates of metabolism of the oxygen analogs. (Author abstract by permission)

75-1688. Chernoff, N.; Kovlock, R. J.; Kathrein, J. R.; Dunn, J. M.; Haseman, J. K. (Pestic. and Toxic Substances Effects Lab., Environ. Protect. Agency, Research Triangle Park, NC 27711). **Prenatal effects of dieldrin and photodieldrin in mice and rats.** *Toxicol. Appl. Pharmacol.* 31(2): 302-308; 1975. (17 references)

Doses of 1.5, 3.0, and 6.0 mg/kg/day of dieldrin and 0.15, 0.30, and 0.60 mg/kg/day of photodieldrin were administered to pregnant CD-1 mice and CD rats by gastric intubation on days 7-16 of gestation. The highest dose of dieldrin induced significant increases in liver/body weight ratios and reduced weight gain in mice, and resulted in 41% mortality in rats. The highest dose of photodieldrin also induced significant increases in mouse liver/body weight ratios, and resulted in 15% mortality in rats. Teratogenic effects were not observed. The higher doses of dieldrin induced an increase in supernumerary ribs and a concomitant decrease in ossification centers in fetal mice indicating toxicity at these dose levels. Similar changes were not found in the rat. Photodieldrin induced no apparent fetal toxicity in either species. (Author abstract by permission)

75-1689. Beatty, P. W.; Lembach, K. J.; Holscher, M. A.; Neal, R. A. (Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN 37232). **Effects of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) on mammalian cells in tissue cultures.** *Toxicol. Appl. Pharmacol.* 31(2): 309-312; 1975. (4 references)

The effects of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), a toxic byproduct of the production of the herbicide, 2,4,5-trichlorophenoxyacetic acid, upon growth has been studied with in vitro cultures of the following mammalian cell types: HeLa; Balb-3T3; SV101, virus (SV40)-transformed 3T3 mouse fibroblasts; human foreskin fibroblasts, and human lymphocytes. In all cases TCDD added in a final theoretical concentration of 1 μM to the culture medium prior to the addition of cells resulted in no significant inhibition of growth measured after a period of 4 days. Electron microscopic examination of the TCDD-treated cells did not reveal any changes in morphology as compared to untreated cells. Incubation of human fibroblasts and SV101 cells with ^{14}C-labeled TCDD showed that incorporation of the TCDD into the cells did occur. (Author abstract by permission)

75-1690. Villeneuve, D. C. (Bur. Chem. Safety, Health Protect. Branch, Ottawa, Ontario, Canada). **The effect of food restriction on the redistribution of hexachlorobenzene in the rat.** *Toxicol. Appl. Pharmacol.* 31(2): 313-319; 1975. (13 references)

Adult male rats were given hexachlorobenzene (HCB) daily (po) at doses of 0, 1.0, 10, and 100 mg/kg for 14 days. The diet of these animals was then restricted to 25% of their normal food intake for a period of 10 days after which all animals were killed and their tissues removed for HCB analysis. Food restriction caused a mobilization of the HCB stored within the fat depot which resulted in a transfer of this compound into the plasma and other tissues of the body. Toxic signs including loss of appetite, tremors, and death occurred in the groups of animals receiving 100 mg HCB/kg and subjected to food restriction. The tissue residue profile indicated that death occurred when brain concentration exceeded 300 ppm. (Author abstract by permission)

75-1691. Mirvish, S. S. (Eppley Inst. Res. Cancer, Univ. Medical Center, Omaha, NB 68105). **Formation of *N*-nitroso compounds: chemistry, kinetics, and in vivo occurrence.** *Toxicol. Appl. Pharmacol.* 31(3): 325-351; 1975. (117 references)

Human exposure to carcinogenic *N*-nitroso (NO) compounds may occur due to their formation in food, e.g., during storage or preparation; or in vivo, e.g., in the stomach by acid-catalzyed reaction of nitrate withcertain nitrogen compounds. A review is presented of the chemistry of NO-compound formation, kinetics of *N*-nitrosation, nitrosation in vivo, effect of ascorbate and other compounds reacting with nitrite, formation of NO-compounds from drugs and pesticides, and general conclusions. Pesticides which have been reported to form *N*-nitroso compounds include benthiazuron, carbaryl, propoxur, fenuron, atrazine, simazine, ziram, thiram, ferbam, and succinic acid 2,2-dimethylhydrazide. Some of the resulting compounds have been proven carcinogenic and mutagenic. In most cases appreciable nitrosation occurred only under severe conditions. To evaluate the actual hazard presented by nitrosatable compounds, the following studies should be performed: examination of structure and dissociation rate; determination of NO-compound formation; water solubility; nitrosation kinetics; toxicity of NO-derivative; toxicity of compound administered with nitrite; effect of nitrite-binding compounds on the preceding; and epidemiologic studies on exposed individuals.

75-1692. Borison, H. L.; Snow, S. R.; Longnecker, D. S.; Smith, R. P. (Dep. Pharmacol. Toxicol., Dartmouth Med. Sch., Hanover, NH 03755). **3-Chloro-*p*-toluidine: effects of lethal doses in rats and cats.** *Toxicol. Appl. Pharmacol.* 31(3): 403-412; 1975. (12 references)

3 - Chloro - *p* - toluidine (3 - CPT) given systemically to rats or into the cerebroventricular system of cats produced death in respiratory arrest. Respiratory depression in cats can also be induced by the rapid systemic infusion of 3-CPT, but methemoglobin formation and hemolysis are complications of the i.v. route in cats. The respiratory effects of 3-CPT in cats, mimie those of surgical vagotomy, e.g., alterations in pattern, slowing of rate, and abolition of the Hering-Breuer reflex. Despite these drastic changes, the CO_2—tidal volume response relationship was not altered. Incidental effects observed after i.p. injection in rats, which may at least in part be secondary to hypoxia, include metabolic acidosis (lactic acidemia), hyperkalemia, hemoconcentration, loss of plasma proteins, and ascitic fluid in the abdomen. Rats also exhibited an early and transient skeletal muscle paralysis which is probably of central origin. A transient fall in blood pressure prior to the final state of collapse may be due to direct capillary vasodilation. In the late stages of collapse the peripheral vasodilation may be replaced by an increase in capillary permeability. 3-Chloro-*p*-toluidine appears to be directly cytotoxic, and on serosal surfaces it produced superficial necrosis 1—6 cell layers deep after only 3—8 hr of contact. (Author abstract by permission)

75-1693. Beroza, M.; Inscoe, M. N.; Schwartz, P. H., Jr.; Keplinger, M. L.; Mastri, C. W. (Agric. Res. Service, U.S. Dep. Agric., Beltsville, MD 20705).**3 Acute toxicity studies with insect attractants.** *Toxicol. Appl. Pharmacol.* 31(3): 421-429; 1975. (19 references)

Eight insect attractants and one inhibitor of a sex attractant were tested for acute oral and aerosol inhalation toxicity in rats, for acute dermal toxicity, eye irritation, and primary skin irritation on rabbits, and for toxicity to rainbow trout and bluegill sungish. Except for phenethyl propionatet eugenol, 7:3 (acute dermal LD50, 1220 mg/kg), none of the tests materials was classified as more than slightly toxic. (*Z*)-7-Dodecen-1-ol acted as a primary skin irritant, since it caused superficial chemical burns. (Author abstract by permission)

75-1694. Nazer, I. K.; Archer, T. E. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616). **In vitro studies on bee brain acetylcholinesterase-organophosphorus complex utilizing oxime drugs.** *Toxicol. Appl. Pharmacol.* 31(3): 459-464; 1975. (19 references)

The oxime drugs pyridine- 2 -aldoxime methiodode (2-PAM) and diacetyl monoxime (DAM) were tested in vitro for their effect on the recovery of paraoxon- or malaoxon-inhibited acetylcholinesterase (AChE) from honey bee brain. Concentrations of .378-378 n*M* 2-PAM produced 0.9-100% activity recovery, and 9.9 p*M* to 990 n*M* DAM produced 11.8-95.3% activity recovery of paraoxon-inhibited bee brain AChE. Pyridine-2-aldoxime methiodide at concentrations of 3.78-18.9 n*M* also produced 0.7-88.5% activity recovery of malaoxon-inhibited bee brain AChE. (Author abstract by permission)

75-1695. Chadwick, R. W.; Linko, R. S.; Freal, J. J.; Robbins, A. L. (Environ. Protect. Agency, Pestic. and Toxic Substances Effects Lab., Research Triangle Park, NC 27711). **The effect of age and long-term low-level DDT exposure on the response to enzyme induction in the rat.** *Toxicol. Appl. Pharmacol.* 31(3): 469-480; 1975. (17 references)

Some investigations suggest there is an age-dependent susceptibility to enzyme induction in animals, while other work indicates that the apparent lack of response in older animals may be the result of an induction lag period. The existence of such an induction lag in rats as well as the effect of long-term low-level DDT exposure on the response to enzyme induction by dieldrin were investigated in this study. Adult and weanling rats were sacrificed at 24, 48, 72, 96, and 120 hr after i.p. administration of 2.5 mg/kg lindane in peanut oil was administered p.o. Within 24 hr after the administration of dieldrin, there were significant increases in the in vitro activity of various hepatic microsomal enzymes from the weanling rats. Dieldrin did not produce a consistent increase in the enzyme activity of the adults and increases that did occur were much smaller than those in the weanlings. In general, throughout the study, the weanlings had the highest enzyme activity, the DDT-fed adults were intermediate, and the control adults had the lowest activity. Weanlings metabolize more lindane to chlorophenols by 72 hr after receiving dieldrin and

store less lindane by 96 hr after dieldrin administration than either adult group of rats. Data from this experiment does not support the existence of an induction time lag in adult rats. (Author abstract by permission)

75-1696. Eroschenko, V. P.; Wilson, W. O. (Dep. Biol. Sci., Univ. Idaho, Moscow, ID 83843). **Cellular changes in the gonads, livers and adrenal glands of Japanese quail as affected by the insecticide Kepone.** *Toxicol. Appl. Pharmacol.* 31(3): 491-504; 1975. (33 references)

A histological study of normal reproductive organs, livers, and adrenal glands from immature and adult Japanese quail of both sexes and of quail fed 200 ppm of the insecticide Kepone under long and short photoperiods was carried out. Kepone increased cellular proliferation, cytodifferentiation and tubular gland formation in the oviducts of immature quail when kept under 6 hr of light and 18 hr of darkness (6L:18D) and 16 hr of light and 8 hr of darkness (16L:8D). No cellular changes were noted in the oviducts from laying quail. Ovarian tissue from Kepone-treated quail contained more primary oocytes and smaller folicles when compared to control birds. Liver cells from all experimental birds were filled with large, lipidlike inclusions. Hypertrophy of adrenal cortical and medullary cells was noted in all Kepone-treated birds. A detrimental effect of Kepone was recorded in the testes of immature and adult quail under the 16L:8D light regimen. Highly dilated seminiferous tubules, reduced germinal epithelium and spermatozoa, and abundant intraluminal cellular debris were common. The results indicate that the insecticide Kepone has an estrogenlike effect on the oviducts of immature females and on the testes of both immature and mature males. (Author abstract by permission)

75-1697. Rider, J. A.; Puletti, E. J.; Swader, J. I. (Gastrointest. Res. Lab., Ralph K. Davies Med. Cent., San Francisco, CA 94114). **The minimal oral toxicity level for mevinphos in man.** *Toxicol. Appl. Pharmacol.* 32(1): 97-100; 1975. (4 references)

Four groups, of five human volunteers each, were fed various doses of mevinphos daily for 30-day periods to determine its effect on plasma and erythrocyte (RBC) cholinesterase with the following resutls: 1.0 mg had no effect, 1.5 and 2.0 mg each produced a 20% or greater decrease in RBC cholinesterase on one occasion only, while 2.5 mg produced a steady decrease in RBC cholinesterase reaching a maximum of 25% on the 27th day of administration. None of these doses affected the plasma cholinesterase activity. From these results we conclude that 2.5 mg mevinphos meets the criterion for minimal incipient toxicity, which is defined as the amount producing a decrease of 20-25% below control cholinesterase activity. (Author abstract by permission)

75-1698. Cappon, I. D.; Nicholls, D. M. (Dep. Biol., York Univ., Toronto, Ontario, Canada). **Factors involved in increased protein synthesis in liver microsomes after administration of DDT.** *Pestic. Biochem. Physiol.* 5: 109-118; 1975. (36 references)

Experiments were conducted on male Sprague-Dawley rats using DDT and Aroclor 1254 to determine whether the increased incorporation of labeled amino acids into peptide in microsomes was due to altered activity of inhibitory or stimulatory factors as well as to endogenous mRNA. The pesticides were administered in 2 consecutive daily doses, i.p., 200 mg/kg. The livers were examined 72 hr after the second dose. The increased incorporation of (^{14}C)phenylalanyl-tRNA into peptide when microsomes or ribosomes derived from DDT-treated rats were incubated with supernatant was due to other factors besides increased endogenous mRNA. These factors were not related to the decreased activity of ribonuclease inhibitor, nor to the GTP and thiol-sensitive inhibitor. The factors were partly removed from microsomes and completely removed from ribosomes by procedures using a 0.5 *M* KCl wash. Treatment of rats with polychlorinated biphenyls gave results similar to DDT. The 0.5 *M* KCl wash fraction from the control preparations contained factors inhibitory to protein synthesis, in contrast to the wash fractions from the DDT preparations. This evidence indicates that when DDT and polychlorinated biphenyls cause the induction of drug-metabolizing enzymes in liver and cause marked changes in the kidney of rats, there are changes in the protein synthetic machinery. These changes appear to parallel the increased binding of mRNA specific for the induced proteins and probably of mRNA for other proteins of the endoplasmic reticulum. It is not certain that residual amounts of the degradation products of DDT and polychlorinated biphenyls are responsible for the change observed, but the results of adding DDT in vitro strongly suggest that the changes are most unlikely to be due to residues of the unaltered compounds.

75-1699. Wang, C. M.; Narahashi, T.½; Fukami, J. I. (Dept. Physiol. Pharmacol., Duke Univ. Med. Cent., Durham, NC 27710). **Mechanism of neuromuscular block by chlordimeform.** *Pestic. Biochem. Physiol.* 5(2): 119-125; 1975. (19 references)

The mechanism of action of chlordimeform on the frog sciatic nerve-sartorious muscle preparation has been studied by means of microelectrodes. Chlordimeform (0.1 m*M*) suppresses the amplitude of spontaneous miniature end-plate potentials without much changing their frequency. At 1 m*M*, it completely blocks the miniature end-plate potentials. The resting membrane potential is not affected. The end-plate potential evoked by nerve stimulation is also suppressed, while the action potential from the nerve terminal is not impaired. The sensitivity of the end-plate membrane to the transmitter substance as examined by iontophoretic applications of acetylcholine is effectively decreased by chlordimeform. The quantal content of transmitter release is not affected. It is concluded that the block of neuromusclar transmission by chlordimeform is due primarily to a depression of the end-plate sensitivity to the transmitter. It is not possible to conclude whether the neuromuscular block observed in this study plays any significant role in chlordimeform poisoning. However, the neuromuscular blockage is consistent with the observed paralysis of the chlordimeform intoxicated animals.

75-1700. Hassall, K. A. (Dep. Physiol. Biochem., The University, Reading, England). **Species and sex differences in the reductive dechlorination of DDT by supplemented liver preparations.** *Pestic. Biochem. Physiol.* 5(2): 126-134; 1975. (10 references)

This paper reports an investigation into TDE production by 12,000*g* supernate and by microsomes, both heated and unheated, made from livers of several species. Attention was directed to species and sex differences in requirement for riboflavin and the extent to which NADPH or its generating system can be replaced by NADH. The presence of exogenous riboflavin did not augment reduction of DDT to TDE. However, riboflavin added to unheated microsomes supplemented with NADPH or NADH more than doubled the rate of reduction. Heated 12,000*g* supernate, unsupplemented or containing only exogenous riboflavin, did not reduce DDT. Big species differences in activity occurred when NAD(P)H was present, the pigeon and cockerel scarcely reduced any DDT in 2 hr, the Wistar rat supernate being most active. Addition to heated 12,000*g* supernate of 30 μg riboflavin as well as NAD(P)H resulted in increased reductive activity for all 6 species tested. The species difference in effect of exogenous riboflavin between the pigeon and rat was also noted using 4 DDT analogs as substrates. A sex-related difference in activity of preheated, supplemented 12,000*g* supernate from chicken and Norweigian hooded rat liver was not found when unheated preparations were used. In contrast to the activity possessed by preheated 12,000*g* supernate of rat liver supplemented with NAD(P)H, similarly supplemented preheated microsomes did not reduce DDT. On adding riboflavin as well as NAD(P)H, however, preheated hepatic microsomes of both pigeon and rat produced TDE, and this activity was further increasing by adding unheated microsomal (105,000*g*) supernate. The biocatalytic system functioning in preheated preparations appears to need at least one component of heated microsomes, NAD(P)H and one or more water-soluble components.

75-1701. Boyer, A. C. (Shell Develop. Co., Biol. Sci. Res. Cent., Modesto, CA 95352). **Sorption of tetrachlorvinphos insecticide (Gardona) to the hemolymph of *Periplaneta americana*.** *Pestic. Biochem. Physiol.* 5(2): 135-141; 1975. (13 references)

Evidence for the nonspecific binding of tetrachlorvinphos insecticide to the hemolymph of ***Periplaneta americana*** is presented. The amount of insecticide sorbed depends on both the concentration of hemolymph and tetrachlorvinphos used. Acrylamide disc gel electrophoresis and Sephadex column chromatography of the complex revealed that tetrachlorvinphos binds to a variety of proteins in the hemolymph with no one protein serving as a specific carrier. Data indicates that 80% of the LD50 dose of tetrachlorvinphos can bind to the hemolymph contained in a single roach. The observed LD50 value could thus be considered inflated since the hemolymph can sorb large quantities of tetrachlorvinphos and thereby reduce the concentration of free compound available for inducing a toxic event. However, the binding of tetrachlorvinphos to hemolymph can also be looked on as a transport mechanism whereby the compound is transported throughout the roach, to dissociate from the proteins and penetrate into or through the cell membrane at appropriate times. This would in effect enhance the toxicity of the compound.

75-1702. Wu, C. H.; Van den Bercken, J.; Narahashi, T. (Dept. Physiol. Pharmacol., Duke Univ. Med. Cent., Durham, NC 27710). **The structure-activity relationship of DDT analogs in crayfish giant axons.** *Pestic. Biochem. Physiol.* 5(2): 142-149; 1975. (22 references)

Fourteen DDT analogs were examined for their effects on the crayfish giant axons using the intracellular microelectrode technique. Two were without effect and the remaining 12 can be classified into 3 categories according to their actions on membrane excitability, namely excitatory, blocking, and dualist groups. The excitatory group includes *p,p'*-NO_2-, *p,p'*-CH_3O-, *p,p'*-C_2H_5O-, *p,p'*-C_3H_7O-DDT, *o,p'*-DDT, TDE, and *p,p'*-C_2H_5-DDD, all of which increase the excitability of the axonal membrane. The blocking group consisted of *p,p'*-NH_2- and *p,p'*-HO-DDT, both of which blocked the action potential without affecting the resting potential. The dualist group was composed of *p,p'*-CHO-DDT, DCC, and EDO which had both excitatory and blocking actions. The results of this study confirm earlier observations that there is a limit to the steric size of the side chains for an analog to be an effective excitatory compound. Addition of an aromatic ring or a bulky acetamide group renders the analog inactive. The optimum size is that of an ethoxy group. The weak potency observed with *o,p'*-DDT indicates the importance of the *para* positions. The blocking action shared by the amino, hydroxy, and formyl analogs implicates polar side chains and the capability to form hydrogen bonds. One type of blocking action possible involves hydrophilic side chains capable of forming hydrogen bonds. Another type of blocking action may be related to restriction in rotation imposed by the grouping on the benzylic carbon. It is stressed that the dividing lines between these categories are not sharp; the compounds tend to fall along a spectrum between pure excitatory and pure blocking activity.

75-1703. Watanabe, H.; Tsuda, S.; Fukami, J. I. (Nisso Inst. Life Sci., Nippon Soda Co., Ltd., Kanagawa, Japan). **Effects of chlordimeform on rectus abdominis muscle of frog.** *Pestic. Biochem. Physiol.* 5: 150-154; 1975. (4 references)

The effects of chlordimeform on rectus abdominis muscle of frog were studied. Chlordimeform (1 m*M*) caused a slow contraction, and at lower concentrations (10 μ*M* to 1 m*M*) it inhibited the acetylcholine-induced contraction in a noncompetitive manner. When chlordimeform was applied to the muscle of *Rana catesbiana*, K^+-induced contraction was also inhibited in a noncompetitive manner, whereas it had no effect on caffeine-induced contraction. Chlordimeform-induced contraction

was not affected by *d*-tubocurarine (100 μM), procaine (1 m*M*), or eserine (0.3 m*M*), which were similar results to that of K^+-induced contraction. From the data it is speculated that high dose of chlordimeform caused the contraction primarily due to depolarization of cell membrane of rectus abdominis. It might also be deduced that chlordimeform does not directly affect the contractile protein nor sarcoplasmic reticulum and it depresses not only the sensitivity of end-plate but also excitability of cell membrane.

75-1704. Ray, T. B.; Still, C. C. (Dep. Biochem. Microbiol., Cook Coll., Rutgers Univ., New Brunswick, NJ 08903). **Propanil metabolism in rice: a comparison of propanil amidase activities in rice plants and callus culture.** *Pestic. Biochem. Physiol.* 5(2): 171-177; 1975. (12 references)

The activity of propanil amidase, an enzyme in rice which hydrolyzes the herbicide 3,4-dichloropropionanilide (propanil), is 2 to 4 times greater in plants with 4 leaves as compared with plants with fewer than 4 leaves. The higher amidase activity in the 4-leaf plants was localized in the unexpanded leaves. Rice root callus suspension in cultures also demonstrated propanilamidase activity. In vivo experiments indicated that the herbicide was metabolized by the tissue culture. Propanil amidase activity as determined in vitro, however, was detected only after the culture had developed to late stationary phase. Data from the study indicates that young cultures may possess amidase activity below the detection limit of the in vitro assay. Alternatively, the young tissue culture may possess inhibitors which are released in the enzyme preparation, or the product (dichloroaniline) may become undetectable in the colorimetric assay. The ability of both rice plants and tissue culture to metabolize propanil depends on the age of the plant and on the age of culture. The additional facts that the hydrolysis of propanil in both plant and model is enzymic with the activities localized in similar particulate fraction, as well as the sensitivity of enzyme from both sources to carbamate insecticide, allows the conclusions that rice root callus suspension cultures are sufficient to use as a model for the study of propanil metabolism in the rice plant.

75-1705. Saxena, J.; Sikka, H. C.; Zweig, G. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY 13210). **Studies on effects of certain quinones. III. Photosynthetic $^{14}CO_2$ incorporation by *Rhodospirillum rubrum*.** *Pestic. Biochem. Physiol.* 5(2): 189-195; 1975. (14 references)

The regulatory effect of dichlone at sublethal concentrations on photoautotrophic and photoheterotrophic carbon metabolism of *Rhodospirillum rubrum* was studied. Substituted naphthoquinones, dichlone, and menadione produced marked changes in the pattern of ^{14}C-distribution during $^{14}CO_2$-fixation. The most obvious change in the labeling pattern during photoautotrophic $^{14}CO_2$-fixation was a several-fold increase in 3-phosphoglyceric acid accompanied with a decrease in the amount of glutamate. In photoheterotrophic cells, quinones caused an appreciable increase in ^{14}C-glycolic acid and concomitant decrease, althouth not proportional, in the amount of ^{14}C-sugar phosphate. The level of ^{14}C incorporated in poly-β-hydroxybutyrate and ether-extractable lipids was considerably decreased in photoautotrophic and photoheterotrophic cells treated with quinones. The fact that the changes brought about in the $^{14}CO_2$-labeling pattern by treatment with quinones were different in photoautotrophic and photoheterotrophic cells is consistent with the presence of different pathways of CO_2-fixation in these cells. The ability of quinones to interfere with the generation of reduced pyridine nucleotides, and their possible effects on sulfhydryl enzymes appear to be responsible for the reported changes in the path of $^{14}CO_2$-fixation in photosynthetic bacteria.

75-1706. Cocks, J. A.; (Agr. Res. Council, Univ. Sussex, Brighton, Sussex, England). **The metabolism of 1-naphthyl methylcarbamate by *Periplaneta americana*.** *Pestic. Sci.* 5(4): 505-510; 1974. (14 references)

The in vivo release of $^{14}CO_2$ arising from decarbamoylation of 1-naphthyl methyl[14-]carbamate (carbaryl) injected into male and female *Periplaneta americana* was measured over the range from 0.2 to 50 nmol carbaryl/g body weight. The amount of $^{14}CO_2$ released was proportional to the dose of [^{14}C]-carbaryl injected and was not significantly different between male and female cockroaches. Carbaryl was found to be more toxic to male (KD*100*, 12 nmol carbaryl/g) than female (KD*100*, 57 nmol carbaryl/g) cockroaches, at any dose which caused knockdown, females showed a greater ability to recover from the toxic syndrome than did males. The [^{14}C]-carbaryl metabolism (decarbomylation) was temperature dependent and could be partially inhibited by sesamex, tri-orthocresyl phosphate and anoxia. Secondary effects of carbaryl poisoning were severe dehydration of the animals and in some cases abdominal swelling due to air being gulped into the crop. The amount of dehydration was essentially unaltered by the chemical inhibitors, but was partially reduced by anoxia and cooling. In the most severe cases of dehydration animals lost 18% of their body water content. (Author abstract by permission)

75-1707. Lis, T.; Mierzejewski, J. (Inst. Vet. Sci. Res., Pulawy, Poland). **Wplyw foschloru i terationu na aktywnosc dopelniacza swinek morskich.** [**Effect of foschlor and teration on the activity of guinea pig complement.**] *Med. Dosw. Mikrobiol.* 25: 345-350; 1973. (14 references) (Polish)

Guinea pig complement was tested for its activity after in vitro and in vivo exposure to phosphororganic pesticides (foschlor and teration). Statistically significant decreases in activity were found in both experiments. With guinea pigs given the pesticides intramuscularly, the inhibition was preceded by a period of increased complement activity.

75-1708. Lis, T.; Skoczek, A.; Mierzejewski, J. (Author address not given) **Wplyw pestycydow fosforoor-**

ganicznych na niektore bakterie chorobotworcze. [**The influence of phosphoorganic pesticides on some pathogenic bacteria.**] *Med. Wet.* 29(1): 27-28; 1973. (11 references) (Polish)

The effect is reported of phosphoorganic pesticides, commonly used in agriculture, on the growth of some pathogenic bacteria often present in our environment. The effects of stock and use dilutions of fenitrothion, teration, trichlorfon, sadofos, dimethoate, and fenthion on 15 strains of anaerobic bacteria cultured on solid and liquid media are examined. The results showed that the stock solutions of some pesticides inhibited growth, but utilizable solutions did not influence the growth of the pathogenic bacteria under study.

75-1709. Camargo, L. A. A.; Yashuda, Y.; Saad, W. A.; Cabral, A. M. (Dep. Physiol. Sci., Sch. Pharm. Odontol., Araraquara, Sao Paulo, Brazil). **Effect of intrahypothalamically injected parathion on food and water intake of normal and fasted rats.** *Pharmacol. Res. Commun.* 7(2): 189-197; 1975. (14 references)

The effect of parathion injected directly into the hypothalamus on the food and water intake of the rat was investigated. Parathion (1-2 μl) was injected into the lateral hypothalamic area (LHA) and ventral medial nucleus (VMN) of male Holtzman rats via implanted cannulae; controls were injected with the corn oil vehicle only. Parathion injected into the LHA increased water intake in both satiated and fasted (14 hr) rats, the increase being significant with only 1 μl in the fasted group. Injected into the VMN, parathion significantly increased the water intake of the fasted rats, but did not significantly affect the water intake in the satiated animals. Injection of parathion into the LHA significantly decreased food intake, particularly in the fasted animals, while injected into the VMN, it significantly increased the food intake of both groups.

75-1710. Matsumura, F. (Dep. Entomol., Univ. Wisconsin, Madison, WI). **Toxicology of insecticides.** Plenum Press, New York, 1975, 503 p. (1335 references)

The present volume was intended to serve as a comprehensive text in the field of insecticide toxicology, suitable for use by graduate students and the general scientific community. Chapters included are: introduction (patterns of pesticides use); general principles of insecticide toxicology (toxicity evaluation in insects and higher animals, analytical methods); classification of insecticides; modes of action of insecticides; metabolism of insecticides by animals and plants; entry of insecticides into animal systems; dynamics of insecticide movement in the animal body; movement of insecticides in the environment; environmental alteration of insecticide residues; effects of pesticides on wildlife; and hazards to man and domestic animals, including acute poisoning, chronic toxicity (with carcinogenicity and mutagenicity), and residues in man. An attempt has been made to examine all possibilities, even those which are not currently well founded scientifically, and to critically assess unproven claims and hypotheses. Comparison of unrelated works was avoided when possible.

75-1711. Oga, S.; Yasaka, W. J. (Inst. Cienc. Biomed., Univ. Sao Paulo, Sao Paulo, Brazil). **Toxicidade aguda do composto *O,O*-diisopropil-*S*-benziltiofosfato em ratos e camundongos.** [**Toxicity of a new insecticide, *O,O*-diisopropyl-*S*-benzylthiophosphate (Kitazin-P) in rats and mice.**] *Rev. Brasil. Pesqui. Med. Biol.* 7(1): 1974. (10 references) (Portuguese)

Acute toxicity of a new insecticide *O,O*-diisopropyl-*S*-benzylthiophosphate (Kitazin-P) was studied in two species, rats and mice. Primary toxic symptoms, such as the increase of salivation and lachrymation, diarrhea, and urinary incontinence, appeared 5 to 30 min after oral administration of the drug and persisted from 48 to 72 hr according to the dose employed. These symptoms were more intense in female rats than in males, but no such difference was observed in mice. The LD50 value for mice was found to be significantly lower than for rats. Pretreatment of rats with phenobarbital, the classical inducer of microsomal enzymes, did not alter the toxicity of Kitazin-P.

75-1712. Ludwicki, J. K. (Inst. Food Anal., Natl. Inst. Hyg., Warsaw, Poland). **Wpływ wybranych związków na enzymy frakcji lizosomalnej watroby szczura. Cz. I. Badania in vitro.** [**The effect of selected compounds on the enzymes in lysosomal fraction of rat liver. I. In vitro investigations.**] *Rocz. Panstw. Zakl. Hig.* 25(3): 287-293; 1974. (22 references) (Polish)

The isolated lysosomal fraction of rat liver was used to determine the sensitivity of lysosomes and their enzymes to four insecticides (aldrin, dieldrin, endosulfan, and endrin) and three detergents (sodium laurylbenzenesulfonate, dimethyl lauryl-benzalconium bromide, and sodium laurylsulfate). Results of determinations of the activity of β-glucuronidase, acid phosphatase and cathepsin D showed that this activity is inhibited by aldrin, endrin, and endosulfan, and that the lysosomes are relatively highly sensitive to all tested detergents.

75-1713. Tobe, M. (Natl. Health Res. Lab., Tokyo, Japan). [**Toxicity of organophosphorus compounds.**] *Kagaku Kogyo (Chem. Ind. (Tokyo))* 26(2): 176-180; 1975. (Japanese)

The toxicity of organophosphorus esters is discussed and LD50 values are given for 85 esters on rats. The toxic effects of organophosphorus esters on humans can be classified into two categories; localized effects from contact with or inhalation of compounds; and whole-body effects from ingestion of compounds. In acute intoxications, death generally occurs within 5 min to 24 hr after the first contact with organophosphorus esters. The primary cause of death in such cases is cardiocirculatory failure and respiratory paralysis. The chronic toxicity of organophosphate pesticides is as yet unresolved. Although the exact mechanism of organophosphate poisoning in man is not clearly understood, these esters inhibit the

activity of cholinesterase (ChE), which hydrolyzes acetylcholine (ACh). ACh is one of the transmitters of stimulation in human nerve systems and is decomposed in the presence of ChE. Therefore loss of ChE activity due to organophosphorus esters saturates the ACh level in the nervous systems, and the role of ACh as a stimulus transmitter is lost, resulting in nervous malfunction.

75-1714. Nishiuchi, Y.; Yoshida, K. (Agr. Chem. Inspect. Stn., Tokyo, Japan). [**Effects of pesticides on tadpoles, Part 3.**] *Noyaku Kensasho Hokoku (Bull. Agric. Chem. Inspect. Stn.)* 14: 66-68; 1974. (2 references) (Japanese)

Thirty kinds of pesticides registered since 1973, consisting of 13 insecticides, 7 fungicides, and 10 herbicides, as well as sodium pentachlorophenate as standard, were tested for toxicity to tadpoles of *Bufo bufo japonicus* 25-35 days after hatching. The average body weight was 0.34 g. The 24, 48, 72, and 96 hr TLm values were determined in aqueous pesticide 200 ml of solution at 25°C. The values obtained for 72 hr TLm were: 5.1, 7.3, >40, .73, 14, 7.3, >40, 22, 28, >40, 0.070, 0.018, 5.9, 7.3, 12, 7.6, 3.5, 3.5, >1000, 0.35, >40, 34, 1.3, >40, >40, >40, 1.8, 14, >40, 16, and 0.32 for isoxathion, isothioate, calvinphos, dialiphol, propaphos, pyridafenthion, acephate, terbam, promecarb, chloromethane sulfonamide, tricyclohexyltin hydroxide, polynactin, turpentine oil, thiabendazole, echlomezol, oxycarboxin, carbendazol, copper 2-hydroxy-5-nonylbenzene sulfonate, copper pentachlorophenate, asulam, molinate, oxadiazon, propyzamide, chlomethoxynil, nitralin, butachlor, phenopylate, MCPA potassium, MCPA-butyl, and sodium pentachlorophenate. The susceptibility of carp to these pesticides was similar to that of *B.b.j.* tadpoles except for a few pesticides. The names used for the pesticides were the Japanese officially registered common names.

75-1715. Ishitsuka, R. (Sankyo Co., Ltd., Tokyo, Japan). [**Report on domestic agricultural chemicals. Hymexazol (Tachigaren), 3-hydroxy-5-methylisoxazole.**] *Noyaku Kagaku (J. Pestic. Sci.)* 2(4): 165-185; 1975. (28 references) (Japanese)

A newly registered fungicide for soil-application, 3-hydroxy-5-methylisoxazole, was introduced and described in detail, including its distribution and metabolism in plants, adsorption to and translocation and metabolism in soil, translocation and metabolism in animals, effects on microorganisms, activity in promoting growth of rice plant, toxicity to plants and crops, and toxicity to mammals and aquatic animals. The LD50 to rat is 4678 (m), 3909 (f) mg/kg p.o., that to mouse is 2418 (m), 1968 (f) mg/kg p.o. The subacute and chronic toxicity are fairly low, with little or no mutagenic hazard. The toxicity to aquatic animals is low, as represented by a 48 hr TLM or more than 40 ppm. In soil, the persistence of Tachigaren depends on the soil microorganisms, it is ultimatly metabolized to acetone, ammonia, and carbon dioxide via acetoacetamide and 5-methyl-2(3H)-oxazolone. In animals it rapidly was excreted in the urine as sulfate and β-D-glucopyranoside.

75-1716. Nakanishi, T.; Takahi, Y.; Tomita, K. (Agric. Chem. Res. Lab. Sankyo Co., Ltd., Shiga, Japan). **Microbial conversion of hymexazol in soil.** *Nippon Shokubutsu Byori Gakkaiho (Ann. Phytopathol. Soc. Jpn.)* 40: 383-391; 1974. (8 references)

The metabolism of hymexazol (3-hydroxy-5-methylisoxazole) in soil was studied using ^{14}C-labeled chemical (at the 3 position on the isoxazole ring) to obtain fundamental information on the persistence of its residues. Radioactive hymexazol was degraded in unsterilized soil, and three radioactive metabolites were identified as carbon dioxide, acetoacetamide, and 5-methyl-2(3H)-oxazolone. The amount of $^{14}CO_2$ evolved from radioactive hymexazol-treated soil increased with time, whereas those of the other metabolites decreased. The breakdown of hymexazol in unsterilized soil is biological, since only a trace of $^{14}CO_2$ was evolved from the sterilized soil. Production of $^{14}CO_2$ was remarkable in submerged soil compared to moist soil. The amount of $^{14}CO_2$ evolved from radioactive hymexazol treated soil increased with increasing temperature levels from 15 to 35°C. Hymexazol was also degraded to CO_2 acetoacetamide, and 5-methyl-2(3H)-oxazolone in soil infested with *Bacillus subtilis, Streptomyces griseus, Aspergillus niger, Arthrinum* sp., or *Pencillium* sp. A certain portion of himexazol and/or its metabolites was so tightly adsorbed by the soil that it could not be removed by extraction with 1 *N* HCl and subsequent elution with 1 *N* NaOH or methanol. Since acetoacetamide and 5-methyl-2-(3H)-oxazolone were found to be less effective than hymexazol against *Fusarium* wilt of cucumber, the metabolism of hymexazol in soil can be considered as a detoxication step.

75-1717. Kozukue, H.; Yoshiba, S.; Shikano, K.; Oshima, K. (Sch. Hyg., Jikei Med. Coll., Tokyo, Japan). [**Experimental study on the appearance of punctate basoerythrocytes by duplicate administration of lead acetate, DDT, and PCB.**] *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 30(1): 114; 1975. (Japanese)

Six male rabbits weighing 2.5-3.5 kg were injected s.c. daily for 7 days with 0.7 ml/kg (A) and 0.4 mg/kg (B) of PCB in olive oil solution (200 mg/ml); 0.13 ml/kg of PCB, 0.07 ml/kg of lead acetate (1.83% aqueous solution), and 0.27 ml/kg of DDT (emulsion containing 10 mg/ml), (C) and (D); 0.1 ml/kg of PCB, 0.05 ml/kg lead acetate and 0.2 ml/kg of DDT (E) and (F). Their blood was examined for stippled basoerythrocytes and reticulocytes. In rabbit (A), stippled basoerythrocytes began to appear from day 7 after first administration and increased before slowly decreasing. In rabbit (B), they did not appear. In rabbits (C) and (D), stippled basoerythrocytes began to appear on days 7 and 8, increased for several days, then decreased. In rabbits (E) and (F), only a very small number of stippled basoerythrocytes appeared sporadically. Reticulocytes in (A) and (B) slowly increased, and a decreasing trend after stopping administration was not conspicuous. In (C) and (D) they showed less change than in (A) and (B). In (E) and (F) the change was even less.

75-1718. Kitamura, M.; Hayakawa, K.; Shibata, T. (Sch. Pub. Health, Fac. Med., Kobe Univ., Kobe, Hyogo, Japan). [**Experimental study on the accumulation and diminution of BHC in fish bodies.**] *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 39(1): 121; 1975. (Japanese)

Carp were reared in glass vessels and in an artifical model river in which α-, β-, and γ-BHC were maintained at 0.05 ppm. Each week 2 carp were killed for analysis of BHC accumulation. After 6 weeks the water in the river was replaced with pure water and 2 carp were killed weekly to analyze the changes in BHC accumulated in the body. The accumulation of γ-BHC increased linearly for 4 wk, then reached a plateau with a concentration about 250 times that in the water. The diminution of γ-BHC showed a half-life 2.5 days of up to 2 wk, then a half-life of 35 days. It took about 35 days for β-BHC to reach the maximum accumulation, about 500 times that in water, and it showed a tendency to decrease from 6th week on. The dimunution of β-BHC showed nearly the same tendency as that of γ-BHC.

75-1719. Nagasaki, H.; Tomii, S.; Tsumashika, T. (Sch. Hyg. Nara Prefecture Med. Coll., Nara, Japan). [**Factors affecting tumorigenesis in the livers of mice by BHC and PCBs.**] *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 30(1): 134; 1975. (Japanese)

The sex differences in tumorigenesis and the effects of separate and simultaneous administration of BHC (α-, β-, and γ-isomers) and PCBs (penta-, tetra-, and trichloro-compounds) were investigated. Strain dd mice of both sexes were given each BHC isomer at 500, 250, or 100 ppm in the diet for 24 weeks. Other mice were given penta-, tetra-, and trichloro-PCB at 500, 250, or 100 ppm in the diet for 36 weeks, and others were fed for 24 weeks with a combination of α-BHC at 250, 100, or 50 ppm and penta- or tetrachloro-PCB at 250 and 100 ppm in the diet. Upon pathohistological examination at autopsy after the last administration, it was found that the frequency of liver tumorigenesis was higher in males given the α-isomer of BHC and pentachlorobiphenyl than in females. In the case of combined administration, especially at the higher dose rates, the ratio of liver weight to body weight increased and there was an increased incidence of liver cancer, although there was no difference in frequency of tumorigenesis in the liver. At the lower dose rate of α-BHC in which no liver tumorigenesis was seen, the addition of PCB induced liver tumorigenesis. A particularly high cancer incidence was obtained in the group given pentachlorobiphenyl at 250 ppm.

75-1720. Froc, J.; Hascoet, M. (Lab. Phytopharm., I.N.R.A., Versailles, France). **Etude experimentale de la contamination du lait par les pesticides organochlores presents dans la nourriture des chevres.** [**Contamination of milk by chlorinated insecticides present in goat feed.**] *Phytiat. Phytopharm.* 22(2): 201-208; 1973. (French)

Relationships between the organochlorine pesticide intake and the residue levels in goat milk were studied to establish maximum allowable residue levels in feed. The animals were fed a feed containing 0.065 ppm BHC, 0.085 ppm α-BHC, 0.206 ppm lindane, 0.125 ppm β-BHC, 0.097 ppm heptachlor epoxide, and 0.133 ppm dieldrin. The milk obtained from these goats contained 0.333 ppm BHC, 0.176 α-BHC, 0.166 ppm lindane, 0.890 ppm β-BHC, 0.303 ppm heptachlor epoxide, and 0.338 ppm dieldrin relative to the fat content. The rates of passage of the organochlorine pesticides into the milk fat were determined to be 12.2% for BHC, 4.9% for α-BHC, 1.9% for lindane, 17.2% for β-BHC, 7.5% for heptachlor epoxide, and 6% for dieldrin. Based on a daily feed consumption of 3 kg, the maximum allowable pesticides residue levels in feed were set at 0.019 ppm for BHC, 0.048 ppm for α-BHC, 0.123 ppm for lindane, 0.014 ppm for β-BHC, 0.032 ppm for heptachlor epoxide, and 0.039 ppm for dieldrin.

75-1721. Chang, E. S.; Stokstad, E. L. R. (Miles Lab., Inc., Elkhart, IN 46514). **Effect of chlorinated hydrocarbons on shell gland carbonic anhydrase and egg shell thickness in Japanese quail.** *Poultry Sci.* 54(1): 3-10; 1975. (17 references)

Japanese quail (*Coturnix japonica*) were fed different levels of pesticide in their diets for 15 weeks. The levels of pesticide used were 25, 50, 100, 200 ppm DDE; 25, 50, 100, 200 ppm DDT and 50 ppm PCB. Carbonic anhydrase activities were analyzed in the shell glands and blood; pesticide concentration in the eggs of the first experiment was measured; egg weight, shell weight and shell thickness were also measured. No depression in growth was observed at any levels of pesticides used. Quail fed 200 ppm DDE showed a high mortaility rate after 10-12 weeks on the diet, while other levels produced no increase in death rate. Lower levels of DDT and DDE (25 and 50 ppm) had no significant effect on egg shell weight or thickness. Higher levels (100 and 200 ppm) of DDT and DDE produced a small increase in shell weight and a 5% decrease in shell thickness and were associated with increased shell breakage. At levels of 25 and 50 ppm DDE, the activity of carbonic anhydrase in the shell gland was signficantly increased. At levels of 200 ppm DDE and 100 ppm DDT in the diet, the activity of carbonic anhydrase was decreased by 12-15%. A 50% reduction in carbonic anhydrase activity in the shell gland seemed to be necessary for an increased production of soft shelled eggs when it was induced by sulfanilamide. Pesticide residues in the eggs of Japanese quail up to about 300 ppm DDE and 150 ppm DDT were not associated with any change in egg shell thickness. At about 600 ppm DDE and 500 ppm DDT in the eggs, corresponding to 100 and 200 ppm in the diet, the egg shell thickness was reduced by 5%. PCB at 50 ppm produced a small decrease (4.5%) in shell thickness and an increase in the percentage of cracked eggs. (Author abstract by permission)

75-1722. Nishimura, M.; Sakama, H.; Aoki, H.; Nishiwaki, K. (Sch. Hyg., Tokyo Dental Coll., Tokyo, Japan). [**Inhalation toxicity of pesticides in application series 2. Toxicity of 2-chloro-1-(2′,4′,5′-trichlorophenyl)**

vinyl dimethyl phosphate.] *Sangyo Igaku (Jpn. J. Ind. Health)* 16(6): 523-530; 1975. (12 references) (Japanese)

Acute and subacute inhalation toxicity tests were made on 2-chloro-1-(2′,4′,5′-trichlorophenyl) vinyl dimethyl phosphate using mice. Skin and eye irritation tests using rabbits and acute oral toxicity tests using mice and rats were carried out. The acute oral LD50s found were 4200, male mouse; 17000, female mouse; 4000, male rat; and 9100, female rat, mg/kg. The acute dermal LD50s were >7500, >10000, >10000, and >10000 mg/kg in the above order. The acute subcutaneous LD50s were 16000, 15000, >15000 and >15000 mg/kg, in the above order. The acute intraperitoneal LD50s were 1170, 1410, 1160, and 1450 mg/kg. The acute inhalational LC50 (4 hr) was >1500 mg/m3. only reduced cholinesterase activities in plasma, erthryocytes, and the brain were recorded in mice exposed to 150 mg/m3 for 4 hr. Results of the subacute inhalation tests (4 hr/day, 5 days/week for 3 weeks) at 30 and 150 mg/m3 indicated only depression of plasma cholinesterase activity but no deaths. Skin and eye irritation were not noticed in rabbits.

75-1723. Carter, L. J. (Author address not given). **Cancer and the environment (I): a creaky system grinds on.** *Science* 186(4160): 239-242; 1974.

The decision to ban aldrin and dieldrin as health hazards has come nearly 4 yr after the ban was first requested. Tests subsequent to the order to suspend manufacture showed unequivocally that dieldrin caused liver tumors in several strains of mice. The evidence that dieldrin is a carcinogen in the rat is less conclusive. Although the incidence of tumors increases with dose, the incidence is statistically significant at dosages as low at 0.1 ppm, the lowest dosage ever tested in an animal species. This is considered alarming as virtually all Americans have dieldrin in their adipose tissues. Shell, the sole producer of dieldrin has based its defense largely on the contention that the mouse data cannot be used to predict carcinogenicity in man. Regarding heptachlor and its major metabolite, heptachlor epoxide, which are expected to replace dieldrin and aldrin in the corn fields, a mouse test 9 years ago indicated that these substances were carcinogenic. Carcinomas were found in about 75% of the mice fed heptachlor and in more than 90% of those receiving heptachlor epoxide. EPA is expected to give notice soon of its intent to cancel heptachlor's registration, thus giving rise to another torturous cancellation proceeding. The need for adequate testing programs for all presistent pesticides is stressed.

75-1724. Mirck, M. H. (Klin. Inwendige Ziekten en Gerechtelijke Diergeneesk., Utrecht, The Netherlands). **Een geval van uitgebreide Chorioptes schurft bij en paard.** [**Extensive chorioptic mange in a horse. Case report.**] *Tijdschr. Diergeneesk.* 98(12): 580-581; 1973. (2 references) (Dutch)

A case of extensive chorioptic mange due to *Chorioptes bovis varietas equi* in an 18-month-old horse is reported. Treatment consisted of clipping the legs and applying a lindane (Neo-scabexan) solution of 0.036% once daily for two consecutive days. The horse then was treated once again at a two-day interval. In cases of chorioptic mange, treatment of the entire animal is recommended rather than confining the therapy to topical application.

75-1725. Savytsky, I. V.; Hotsulyak, L. O. (Dep. Biochem., M. I. Pirogov Med. Inst., Odessa, USSR). **Effect of thiophosphamide on cobalt content in rabbit organs.** *Ukr. Biokhim. Zh.* 45: 212-214; 1973. (14 references)

The application of thiophosphamide (thio-tepa) causes rather noticeable changes in the cobalt content of the liver, kidney, muscles, heart, blood, lungs, and small intestine of the rabbit. The organ specificity is an important point in the observed changes. The nature of the changes in the cobalt content is dependent on the amount of time which has passed after the introduction of the thiophosphamide.

75-1726. Balashova, Ye. K.; Pevzner, D. L.; Rozengart, V. I.; Sherstobitov, O. Ye. (I. M. Sechenov Inst. Evolutional Physiol. Biochem., Acad. Sci. USSR., Leningrad, USSR). **Gidrofobnost' fosfororganicheskikh ingibitorov kholinesterazy i nekotoryye osobennosti ikh raspredeleniya v organizme.** [**Hydrophobic properties of organophosphorus cholinesterase inhibitors and some peculiarities in their distribution in the body.**] *Ukr. Biokhim. Zh.* 46(3): 312-316; 1974. (13 references) (Russian)

The hydrophobic properties (distribution coefficient in hexane-water system) and some peculiarities in the distribution in the body of three different hydrophobic organophosphorus cholinesterase inhibitors of the *O*-alkyl-*S*-hexylthiophosphonate series (GA-89, GA-71, and GA-95) were studied. The hydrophobic character intensified with the increase of the hydrocarbon radical in the *O*-alkyl group, which was also accompanied by an increase in the ability of the inhibitors to link reversibly with red blood cells in rats and rabbits. Following i.v. injection to rabbits, the blood level of free inhibitors fell rapidly after 1 to 3 min, and the rate of the decrease correlated with the hydrophobic properties of the inhibitors. High content of the inhibitors in the lungs, particularly shortly after injection, was detected. The perfusion of the lung decreased the content of free organophosphorus inhibitors. The hydrophobic organophosphorus inhibitors are suggested to be capable of reversible sorption on the surface of the blood vessel endothelium.

75-1727. Nikandrov, V. N. (Belorussian Sci. Res. Inst. Vet., Minsk, USSR). **Intensivnost' pereaminirovaniya s aspartata na alpha-ketoglutarat v tkanyakh krys pri vliyanii 2 - metil - 4 - khlor - fenoksi - gamma - maslyaney kisloty.** [**Intensity of reamination from aspartate for γ - keto - glutarate in rat tissues as affected by 2 - methyl - 4 - chloro - phenoxy γ - butyric acid.**] *Ukr. Biokhim. Zh.* 46(3): 364-367; 1974. (10 references) (Russian)

The effect of single doses of 2 - methyl - 4-chlorophenoxy γ - butyric acid on the intensity of reamination from aspartate for α - ketoglutarate was studied in albino rat tissues. Administration of 2 - methyl - 4 - chloro-

phenoxy - -γ - butyric acid in a dosis of 1,570 mg/kg (LD16) led to an inhibition of the activity of the bound form of aspartate aminotransferase (GOT) in the liver and skeletal muscles. The aspartate aminotransferase activity increased in the brain during the first 3 hrs after poisoning. The total activity of aspartate aminotransferase in the skeletal muscles increased within all time intervals (1, 3, and 6 hrs after poisoning) due to activation of the free form of the enzyme. In a dose of 785 mg/kg, the preparation intensified the transamination in the brain and muscles during the first hours after poisoning, but inhibited it by the sixth hour because of the inhibition of the bound form of the enzyme and, in the skeletal muscles, also of the free form. Redistribution of the different forms of the enzyme was observed only in the liver.

75-1728. Grapov, A. F.; Mel'nikov, N. N. (All-Union Sci. Res. Inst. Chemical Means Plant Protection, USSR). **Fosfororganicheskiye fungitsidy.** [**Organophosphorus fungicides.**] *Usp. Khim.* 42(9): 1681-1697; 1973. (263 references) (Russian)

Organophosphorus fungicides, their structures, uses, and toxicity are reviewed. The toxicity of *O,O* - diethyl - 6 - carbethoxypyrazolopyrimidine - 2 - thiophosphate (Noe 2873) was found to be 140 mg/kg in rats, 435 mg/kg in rabbits, and 184 mg/kg in guinea pigs. The LD50 of kitazin, kitazin-P, and inezin in rats was determined to be 320 mg/kg, 640 mg/kg, and 750 mg/kg, respectively. Dauko 199 (*O,O*-diethylphthal-imidothiophosphate) has an acute toxicity of 5,000-5,500 mg/kg in warm-blooded animals. Its low cholinesterase-inhibiting action is due to its high alkylating capacity. A bibliography of 263 entries is presented of the literature or organophosphorus fungicides.

75-1729. Franke, L. (Author address not given). **Umweltbezogene Wirkstoffuntersuchungen. Tests zur toxikologischen Beurteilung von Pflanzenschutzmittel-Rueckstaenden nur begrenzt aussagekraeftig.** [**Environment oriented substance examinations. Tests for toxicological evaluation of pesticide residues are of limited value.**] *VDI-Nachrichten.* 29(6): 2; 1975. (German)

The irrelevancy and insufficiency of toxicological tests on individual pesticides and other residues in foods has been demonstrated by Gottschewski's experiments on the possible combination effects and interactions of different residues. Rabbits fed residue-free standard fodder pellet during 5 yr showed the highest rates of fertility and live birth, while these parameters were significantly reduced in rabbits fed a diet purchased in the market. In addition, both the mothers and their offspring were much more resistant to endogenous and exogenous factors, including the effect of drugs, when kept on residue-free diet. On a larger scale, these findings may indicate a possible causative relationship between the high incidence of aggressiveness and hyperkinesis in children in industrialized countries and the generally high level of food contamination by pesticide residues and artifical food additives in these countries.

75-1730. Yevdokimov, E. S. (Turkmenian Sci. Res. Inst. Animal Breeding Vet. Med., USSR). **Vliyaniye khlororganicheskikh pestitsidov na organizm zhivotnykh.** [**Effect of organochlorine pesticides on animals.**] *Veterinariya (Moscow)* 12: 94-95; 1974. (Russian)

Rats were fed a 500 mg/kg dose of technical DDT composed of 29.7% DDD (TDE), 3.7% DDE, and 66.6% DDT, 500 mg/kg dose of 12% BHC powder with 19.2% lindane, or 1,000 mg/kg dose of BHC with 10.4% lindane to determine their effects on the organism. Motor coordination disturbances, asthenia, paresis, irritability, tachypnea, and loss of weight were observed 9 days after poisoning. Moderate reduction of the leukocyte and erythrocyte count, degenerative changes in the blood, such as karyopyknosis, karyoclasis in the neutrophils, vacuolization of the leukocyte nuclei, and substantially reduced phagocytic activity of the leukocytes against virulent *Staphylococcus aureus* were determined.

75-1731. Kazanovskiy, Ye. S. (Izhmo-Pechorsk Sci. Res. Stn. Vet., Izhmo-Pechorsk, USSR). **Stepen' perenosimosti i bezvrednosti ruelena i bayteksa.** [**Tolerance level and safety of ruelene and baytex.**] *Veterinariya (Moscow)* 12: 96-97; 1974. (Russian)

General toxicity tests of ruelene and baytex in reindeers are described. Acute toxicosis, and typical symptoms of poisoning with organophosphorus pesticides, such as depression, high pulse rate, tachypnea, defecation, unsteady gait, muscular tremor, hypersalivation, acidification of the urine, and proteinuria were observed following ingestion of 160 mg ruelene and 100 mg baytex per kg of body weight. Ruelene and baytex were lethal in doses of 320 mg/kg and 120 mg/kg, respectively. Both pesticides inhibited the cholinesterase activity following ingestion or application by the pour-on method. In the respective doses of 160 mg/kg and 50 mg/kg, ruelene and baytex caused moderate hyperemia of the gastrointestinal mucosa, subendocardial and subepicardial hemorrhages, pulmonary edema, hepatomegalia and dystrophy of the liver, splenomegalia and hyperemia of the spleen, and the appearance of cells, with large hypochromic nuclei in the inner organs. Following oral administration, the ruelene and baytex residue levels were highest in the tongue and in the tissues of the gastrontestinal tract, while the skin, back muscles, and hairs contained most of the residues following application by the pour-on method. Some 60% of the ruelene, and 45% of the baytex ingested were eliminated with urine during the first 5 days. Following pour-on, some 10% were eliminated during the same time. The meat of reindeers killed 20 days after treatment with ruelene and baytex was hygienically acceptable.

75-1732. Suzuki, T. (Nat. Inst. Agric. Sci., Tokyo, Japan). [**Microbial degradation of pesticides in soil.**] *Shokubutsu Boeki (Plant Protect.)* 27(10): 414-417; 1973. (42 references) (Japanese)

Either chemical or microbial degradation leads to the removal of pesticides from soil. Microbial degradation is discussed in terms of soil sterilization, lag and enrich-

ment periods, mechanisms of microbial degradation, and research models of microbial degradation in Japan. Microbial degradation of pesticides is evidenced by the research observations in which sterilization of soils slows down the degradation rate of certain pesticides in soil. The time for which a pesticide remains in the soil can be shortened by repeatedly spraying the same pesticides. The lag period for degradation can be attributed to the gradual accumlation of microorganisms, which increases the rate of pesticide degradation. Further evidence for microbial degradation can be provided by the addition of a second compound which strengthens the microorganism growth in soil and thus increases the degradation of pesticides. A difference in observations from laboratory scale and field experiments on microbial degradation is often noted, which indicates the involvement of several different types of microorganisms in the degradation of a single pesticide.

75-1733. Cooper, J. E. (Veterinary Res. Lab., Kabete, Kenya). **Trichlorphon as a safe insecticide for use on birds of prey.** *Vet. Rec.* 94(20): 455; 1974. (6 references)

Trichlorphon, a cholinesterase inhibitor, has been used to control a large number of poultry ectoparasites. An experiment was conducted to determine whether the concentration suitable for poultry (0.15%) was also safe for birds of prey, using the following species as examples: *Milvus migrams, Tyto alba, Polyboroides typus, Aquila rapax, Necrosyrtes monachus, Kaupifalco monogrammicus, Haliaeetus vocifer, Accipiter minullus, Hieraaetus fasciatus,* and *Bubo africanus*. The insecticide was sprayed on the birds while they were held by an assistant wearing gloves. About half the volume used was applied specifically to the head and feet and a certain amount allowed to enter the bird's eyes and mouth. Volumes ranged from 10 to 100 ml, depending on the size of the birds. In some cases birds were sprayed with 50 ml volumes for 7 consecutive days to determine the effects or repeated spraying. No bird exhibited clinical signs of toxicity following spraying, and all fed and behaved normally during the subsequent 48 hr. If toxicity should develop, atropine sulfate is recommended as a satisfactory antidote. It is suggested that, in cases of heavy mite infestation, placing the bird under a light anesthesia may prove valuable in order to ensure that the drug is applied thoroughly to the parasitized area.

75-1734. Minar, J.; Breev, K. A.; Barinka, R.; Bakoš, J.; First, V.; Krizo, A.; Valecek, V.; Wilner, L. (Parasitol. Inst. Czech. Acad. Sci., Prague, Czechoslovakia). **Ucinnost ruznych koncentraci trichlorfonu pri pouziti pripravku hypocid, neohypodermin a gipodermin-chlorofos proti streckovitosti skotu.** [**The effectiveness of different concentrations of trichlorfon in the application of the chemical hypocid, neohypodermin, and gipodermin-chlorofos against hypodermosis in cattle.**] *Vet. Med. (Prague)* 19(5): 239-248; 1974. (28 references) (Czech)

Preparations based on the organophosphate trichlorfon (Hypocid, Neohypodermin, and Gipodermin-chlorofos) were applied externally in the autumn period in order to control hypodermosis in central and eastern Slovakia. High effectiveness was demonstrated in doses of 60 mg of trichlorfon/kg. The effectiveness of doses of 20 and 30 mg/kg was low. When doses from 50 to 60 mg of trichlorfon/kg were applied, slight unfavorable signs were observed in four or five per cent of the cattle treated. More severe cases must be ascribed to individual deviations in health conditions. No accompanying signs were observed at doses lower than or equal to 40 mg/kg. A 100% mortality of larvae in the swellings was observed when Hypocid was applied locally in the spring season. For the general treatment of grazing cattle (heifers) in autumn and winter, good effectiveness was found in Hypocid preparations at doses from 40 to 60 mg/kg of trichlorfon, and Neohypodermin in doses of trichlorofon/kg. Doses 50 mg of of 10 ml of Hypocid/kg do not cause any unfavorable accompanying signs. For the spring treatment (suitable also for the control of hypodermosis in cows) Hypocid applied locally in the dose of 1 ml per swelling is highly effective. A new preparation (Arpalit-spray) in a pressurized container was developed in order to make the spring treatment easier and quicker. With respect to effectiveness relative to the quantity necessary for treatment, and to long-term storability (allowing for the use of the preparation produced at the same time for the autumn as well as the spring treatment), the Czechoslovak preparation has been chosen from the three chemicals tested in the trial. This chemical—Hypocid—is recommended in doses from 10 to 15 ml/kg for general autumn treatment and in doses of 1 ml per parasite under the skin for local spring treatment.

75-1735. Ferencik, M.; Stefanovic, J.; Kosutzky, J.; Absolonova, O. (Natl. Immunol. Lab., Fac. Med., Bratislava, Czechoslovakia). **Zmeny aktivit lyzozomalnych enzymov v peritonealnych leukocytoch, sere a slezine sliepok po zatazi lindanom a DDT.** [**Changes in the activities of lysosomal enzymes in peritoneal leucocytes, serum, and spleen in hens affected by lindane and DDT.**] *Vet. Med. (Prague)* 19(6): 327-336; 1974. (22 references) (Czech)

Lindane was given to chickens and young hens for 8 and 34 days at the rate of 100 mg per kg of feed. Results indicate an increase of the specific activity of cathepsin D, β-D-glucuronidase, and (to a smaller degree) lysozyme subcellular fractions of peritoneal leucocytes in comparison with control birds fed a diet containing no lindane. The activity of acid phosphatase was not influenced significantly. An increase of the activity of cathepsin D and β-D-glucuronidase was observed also after the application of DDT (100 mg per kg of feed) to hens. As well as changes in the levels of lysosomal enzymes in leucocytes, the addition of lindane to feed caused a decrease in the content of cathepsin D in the spleens of pullets. These results indicate that lindane and DDT, applied to chickens and hens, can influence the enzymatic activity of cells participating in the defensive and metabolic reaction in the organism. The application of lindane also resulted in a decrease of the concentration of serum lysosome; however, the reduction in the activity of serum cathepsin D, observed at the same time, was not statistically significant.

75-1736. Adamec, O.; Kosutzky, J.; Fellegiova, M.; Ledec, M.; Bobakova, E. (Poult. Res. Inst., Ivanka pri Dunaji, Czechoslovakia). **Zmeny v biologickej ucinnosdti estrogenov po expozich kurciat niektorym insecktícidom z radu chlorovanych uhl'ovodikov.** [**Changes in the biological activity of estrogen after the exposure of chickens to some insecticides of the chlorinated hydrocarbon series.**] *Vet. Med. (Prague)* 19(6): 337-347; 1974. (31 references) (Czech)

Changes of the biological activity of estrogens after short and long-term application of technical DDT and lindane to chickens were studied in trials concerning the mechanisms of the effect of chlorinated hydrocarbon insecticides. The activity of a standard dose of estradiol was tested by the measurement of the increase of oviduct weight and calcium levels in serum at time intervals between the 22nd and 75th day of age. As the basic criterion for the evaluation of the experiment, the differences between the values of indices stimulated in this way in the control groups on the one hand, and the test groups on the other were used. The application of technical DDT at the rate of 100 mg/kg of feed caused relatively small changes in the biological effectiveness of estrogens with the difference between the test and control groups not reaching a significant statistical level. The average values indicate that the stimulation of the oviduct matter growth was suppressed, whereas the levels of serum calcium suggest that that insecticide stimulated the biological activity of the hormone. On the other hand, the application of the same dose of lindane resulted in a highly significant depression of the effectiveness of the standard dose of estrogens in all experimental variants and in both the indices under study.

75-1737. Komissarenko, V. P.; Chelnakova, I. S.; Mikosha, A. S. (Inst. Endocrinol. Metabolism, Kiev, USSR). **Raspredeleniye vody i soderzhaniye elektrolitov v krovi i tkanyakh sobak, poluchavshikh *o,p'*-dikhlordifenildikhloretan.** [**Distribution of water and content of electrolytes in blood and tisssues of dogs administered OETHANE.**) *Vop. Med. Khim.* 20(5): 518-523; 1974. (19 references) (Russian)

The distribution of water and the electrolyte content were studied in dogs that were administered daily 50 mg/kg doses of *o,p'*-DDD (TDE) in corn oil for 14 days. The volume of the extracellular liquid increased due to an expansion of the interstitial space. The volumes of total water and intracellular liquid were not altered. The volumes of plasma and circulating blood decreased. The erythrocyte volume showed no change during the 14 days of the experiment. A decrease in the sodium concentration in the blood plasma was observed, while the potassium concentration showed no change at all. Increased sodium content in the gastrocnemius muscle, adrenal glands, and myocardium was observed. The potassium content decreased in the adrenal glands, and increased in the liver tissue.

75-1738. Karpenko, V. N. (Kiev. Res. Inst. Ind. Hyg. and Occup. Med., Kiev, U.S.S.R.). **Vliyanie ditiokarbaminovych pestitsidov tsineba, maneba i polimartsina na svertyvayushchuyu sistemu krovi.** [**Effect of dithiocarbamate pesticides zineb, maneb and polymarcin on the blood coagulation system.**] *Vrach. Delo. (Kiev)* 1: 122-124; 1975. (8 references) (Russian)

Ethylene-bis-dithiocarbamates zineb, maneb, and polymarcin (a compound of zineb, maneb, and ethylthiuramdisulfide) at 225-250 mg/kg for two months in rabbits resulted in an elevation of blood coagulation activity during the 2-4 weeks of the experiment. This was manifested by shortened recalcification time, increased plasma tolerance to heparin, hyperfibrinogenemia, increase of the thromboplastic activity, changes in the thromboelastrogram, and inhibition of the fibrinolytic activity. By the end of the experiment, however, the blood coagulation activity decreased. It is concluded that these changes in blood coagulation may promote the development of thromobotic and hemorrhagic complications observed in some cases during intoxication with carbamate pesticides.

75-1739. Bookhout, C. G.; Costlow, J. D., Jr. (Dep. Zool., Duke Univ., Durham, NC 27706). **Effects of mirex on the larval development of blue crab.** *Water Air Soil Pollut.* 4(1): 113-126; 1975. (19 references)

The sublethal and lethal effects of 0.01, 0.1, 1.0, and 10.0 ppm mirex on the larval development of blue crabs, *Callinectes sapidus*, from hatching to first crab stage were investigated. After a 5-day period of delayed mortality at all experimental concentrations of mirex, there was differential survival in two replicate series of blue crab larvae in relation to concentration. Concentrations of 0.01 ppb and 0.1 ppb were considered sublethal since 41.5% to 30% of two replicate series of larvae reached the first crab stage. No larvae survived beyond 12 and 13 days in 10.0 ppb mirex, and only 0.5% of 200 larvae in 1.0 ppb mirex reached the first crab stage in one series, and none in the second series. These concentrations were considered acutely. The results of residue analyses are tabulated for larvae reared in the four concentrations of mirex at different periods of development. Larvae reared in a range of concentrations from 0.01 to 10.0 ppb showed increased residue of mirex with increase in concentration. Biological magnification of mirex was greatest in larvae in 0.01 ppb.

75-1740. Kiseleva, N. P. (Author address not given). **Histologische und enzymhistochemische Veraenderungen des Myokards bei akuten exogenen Vergiftungen.** [**Histological and enzyme histochemical alterations of the mycardium following acute exogenous poisonings.**] *Zentralbl. Allg. Pathol. Pathol. Anat.* 116(3): 471; 1972. (German)

The histological and enzyme histochemical alterations in the myocardium of subjects who had diet from acute poisoning with acetic acid, barbiturates, organophosphorus insecticides, or dichloroethane were studied. The individual substances caused more or less characteristic changes that affect predominantly either the stroma and the vessles, or the parenchyma. The altera-

tions observed are indicative of the action mechanism of the poison involved. Depression of the oxidative, and especially of the respiratory enzymes in more or less extended areas as a result of the depression of the energetic processes in the myocardium was observed.

75-1741. Kosyan, Sh. A.; Markosyan, V. Ye.; Sarkisyan, L. S.; Manukyan, R. A. (Dep. Ind. Hyg., Yerevan Med. Inst., Yerevan, USSR). **K voprosu toksikologicheskoy otsenki novogo gerbitsida 3-nitro-4-oksibenzilovogo efira 2,4-dikhlorfenoksiuksusnoy kisloty (NK-2).** [**Toxicological characteristics of the new herbicide, 2,4-D 3-nitro-4-hydroxybenzyl ester (NK-2).**] *Zh. Eksp. Klin. Med. (Yerevan)* 14(3): 14-18; 1974. (9 references) (Russian)

The acute, subacute, and chronic toxicological characteristics of a new herbicide, 2,4-D 3-nitro-4-hydroxybenzyl ester (NK-2) were studied in albino rats. The oral LD50 was determined to be 1,000 ± 170 mg/kg. The cumulation coefficient was found to be 2.748 for 1/5 LD50, and 0.842 for 1/20 LD50, which indicates that NK-2 is a hazardous, cumulative compound of medium toxicity. The clinical picture of the poisoning was characterized by an initial excitation and a final depression. Pareses and paralyses of the limbs, focal hemorrhages in the lungs and kidneys, as well as fatty degeneration and protein type dystrophy of the lung and kidney were observed. Reduction of the erythrocyte and leukocyte counts as well as of the hemoglobin level, and depression of the immunological characteristics (agglutinin and lysozyme titers, phagocytic activity of the leukocytes) were determined as the characteristic effects of NK-2.

75-1742. Mel'nik, N. M. (Mogilev Regional Exp. Agron. Stn., Mogilev, USSR). **Nekotoryye izmeneniya agrobiotsenoza plodovogo sada pod vliyaniyem obrabotok simazinom.** [**Some changes of the agrobiocenosis of a fruit garden under the effect of simazine treatment.**] *Zh. Obshchey Biol.* 35(3): 423-428; 1974. (10 references) (Russian)

The earth under fruit trees in an orchard was treated with simazine during the period from 1964 till 1972 at a rate of 10 kg/ha in the first year, and then at rates of 2.5 or 5 kg/ha in April of each subsequent year, and the effect of the treatment on the phytocenosis was studied. The treatment first resulted in the dominance of simazine-resistant species, such as *Equisetum arvense* L., *Sonchus arvensis* L., and *Echinochloa crus galli* L. A decrease of the herbaceous vegetation was accompanied by that of the soil animal population, and by a deterioration of the soil physical properties and biological activity. These changes, as well as allelopathic relations affected the growth of persistent species. Moss cover developed in vacant spots five to six years later, and promoted the development of soil fauna and microflora, thereby improving the soil physical properties and the biological activity of the humus layer. The equilibrium thus restored was disturbed by draught or by the cessation of the simazine treatment. This resulted in the restoration of the primary synusia, with intermediate dominance of couch grass.

See also 75-1533 75-1566 75-1594 75-1758 75-1769

75-1743. Chow, P. N. P. (Herbicide Lab., Plant Sci. Dept., Res. Stn., Res. Br., Agric. Canada, Brandon, Manitoba, Canada). **An improved toluene/Triton-based liquid scintillation system for counting ^{14}C-labeled compounds at ambient temperature.** *Anal. Biochem.* 60(1): 322-328; 1974. (7 references)

An improved toluene/Triton based liquid scintillation system for counting carbon 14 labeled compounds at ambient temperature was developed to overcome the instability of counting rate. The solution consists of 2,5-diphenyloxazole and 1,4-bis[2-(5-phenyloxazolyl)]-benzene mixed with Triton X-100 (octylphenoxy-polyethoxyethanol). Three additives, Cab-O-Sil (a thioxotropic gelling agent) and the two solubilizers, hyamine hydroxide (quaternary ammonium hydroxide in methanol) and NCS (a mixture of surface-active organic quaternary ammonium bases in toluene) were studied. The compounds were [^{14}C]dicamba, 2,4-[^{14}C]D, [^{14}C]MCPA, and [^{14}C]TCA, either dissolved in ethanol or extracted from seedlings of cereal crops. The counting rates decreased rapidly during the first 10 hr, followed by a further decline at slower rates. The addition of NCS (3.3%, v/v) made the system suitable for measuring the compounds.

75-1744. Forbes, M. A.; Wilson, B. P.; Greenhalgh, R.; Cochrane, W. P. (Environ. Canada, Water Quality Br., Moncton, New Brunswick, Canada). **Confirmation of organophosphorus insecticides by chemical reduction.** *Bull. Environ. Contam. Toxicol.* 13(2): 141-148, 1975. (16 references)

Since a number of organophosphorus pesticides elute at the same retention time on various gas-liquid chromatography columns in both the isothermal and temperature programmed modes, an unambiguous confirmation technique is required. Reduction by chromous chloride provides a sensitive, rapid, and reliable method which can be used advantageously to confirm the presence of organophosphorus insecticides containing a nitro group. In the present study, reaction of chromous chloride with parathion, fenitrothion, and EPN gave yields of 95-98% and only one product was obtained. The phosphates of fenitrothion and parathion were decomposed, the cyano moiety of Surecide was not reduced, and compounds not having a nitro group were unaffected. The reduction reaction as a confirmatory test for pesticides containing an aryl nitro group is best applied using flame photometric and alkali flame ionization detectors; although electron capture was the most sensitive detector for parathion, its sensitivity for aminoparathion was markedly reduced. Using reduction by chromous chloride, pesticide residues in quantities as small as 50 ng/l water and 50 μg/kg in fish or sediment have been confirmed. Other organophosphorus compounds present were not destroyed during the reaction.

75-1745. Greenhalgh, R.; Marshall, W. D.; Kovacicova, J. (Chem. Biol. Res. Inst., Agric. Canada, Ottawa, Ontario, Canada) **Determination of the *S*-methyl isomer in technical grade fenitrothion by gas chromatography and high speed liquid chromatography.** *Bull. Environ. Contam. Toxicol.* 13(3): 291-296; 1975. (11 references)

The *S*-methyl isomer in technical grade fenitrothion was determined by gas chromatography (GC) and high speed liquid chromatography (LC). The amount of isomer present in the sample was determined by comparing peak areas relative to an external standard for both GC and LC. Values of 3.72 ± 0.2% and 3.36 ± 0.2% respectively were obtained. The agreement of these two results is sufficiently close to warrant the assumption that no thermal or on-column rearrangement occurs on GC. A number of commercial samples of technical grade fenitrothion from various sources were analyzed for *S*-methyl fenitrothion. Thin layer chromatograms (TLC) indicated the presence of the isomer in all the samples, together with fenitrooxon. The level of oxon was less than that of *S*-methyl fenitrothion. The GC method is more sensitive, down to 0.1% *S*-methyl isomer, but to determine the oxon as well would require a longer time for analysis. The LC method has a limit of 0.3% for the *S*-methyl fenitrothion.

75-1746. Steinwandter, H.; Buss, H. (Hessische Landwirtschaftl. Versuchsanst., Darmstadt, Germany). **Eine einfache Multimatrixmethode zur Bestimmung von Chlorkohlenwasserstoff-Pestiziden. [Simple multimatrix method for the determination of organochlorine pesticides.]** *Chemosphere* 4(1): 27-30; 1975. (6 references) (German)

A simplified and efficient clean-up method for the subsequent gas-chromatographic determination of organochlorine pesticide residues in routine control is described. Petroleum ether raw extracts are efficiently cleaned on Merck 1061 type Alumina 150, basic, activity degree I-II, with 3-4% water content. Columns packed with this material are suitable for the quantitative elution of organochlorine pesticides, including β-BHC and methoxychlor. The fat retention capacity of the column is 15 mg/g alumina. Experiments with 0.1 to 2.5 μg quantities of BHC, α-BHC, lindane, heptachlor, aldrin, heptachlor epoxide, α-chlordane, γ-chlordane, dieldrin, endrin, *p,p'*-DDE, *p,p'*-DDD (TDE), *o,p'*-DDT, *p,p'*-DDT, and methoxychlor revealed recovery rates ranging from 95 to 100%.

75-1747. Mithyantha, M. S.; Perur, N. G. (Dep. Chem. Soils. Univ. Agric. Sci., Hebbal Bangalore, India). **A simple potentiometric method for the estimation of BHC.** *Curr. Sci.* 43(10): 311-312; 1974. (5 references)

A simple potentiometric method for the estimation of BHC was developed, based on the hydrolysis of BHC under alkaline conditions to trichlorobenzene and inorganic chloride. The inorganic chloride released is estimated using a chloride ion-specific electrode. The concentration of chloride is taken as an index of the concentration of BHC. The method is satisfactory for solutions containing more than 0.1 ppm of BHC. Although the aqueous solubility of this compound is small, its concentration in water solutions can be estimated. The method can be modified for use in the estimation of residues of BHC in

soils and plants. Other chlorine containing compounds must be removed.

75-1748. Lambrino, V.; Voicu, A. (Bucharest, Rumania). **Etude de parathion du materiel biologique a l'aide de l'electrophorese et de la chromatographie. [Study of parathion in biological material by electrophoresis and chromatography.]** *Dokl. Bolg. Akad. Nauk* 27(10): 1385-1398; 1974. (11 references) (French)

Separation and identification of parathion and *p*-nitrophenol, its chief metabolites, in cadaver materials, by electrophoresis and thin-layer chromatography are described. Following trituration with anhydrous sodium sulfate, methanol is added, and the sample is acidified with tartaric acid, which extraction is done with ethyl ether. Electrophoresis is conducted at 400 Volts/20 mAmp, using Whatman paper No. 2. The electrolyte contains 10% formic acid, 10% ammonia, and 0.9 % sodium chloride, and the migration time is 3 hr. Parathion remains at the starting line, and is visualized by means of palladium chloride. The *p*-nitrophenol is identified by means of 10% sodium hydroxide. Thin-layer chromatography, using bentonite silica gel G, or diatomite, is equally suitable for the separation and identification of parathion and *p*-nitrophenol.

75-1749. Lichtenberg, J. J. (Methods Develop Qual. Assurance Res. Lab., EPA, Cincinnati, OH 45268). **Methods for the determination of specific organic pollutants in water and waste water.** *IEEE Trans. Nucl. Sci.* NS-22(2): 874-891; 1975. (57 references)

Methods for the determination of organochlorine, organophosphorus, and organonitrogen pesticides and phenoxy acid herbicides in water and waste water are presented. Methods for the determination of other chlorinated organics such as polychlorinated biphenyls, organic solvents, and other selected organic compounds are included. Gas chromatography when coupled with selective detectors is the most sensitive and selective method for qualitative and quantitative determination of organic compounds that is available. Gas chromatographic methods are selectively applied either directly on the raw sample or after concentration by adsorption or solvent extraction and evaporation. A variety of other determinative methods such as infrared, ultraviolet, and fluorescent spectroscopy; liquid chromatography; and thin-layer chromatography have application in organic analysis. Selected examples of the application of these methods are presented.

75-1750. Burke, J. A. (Div. Chem. Physics, Food Drug Admin., Washington, DC 20204). **Report on chlorinated insecticides.** *J. Assoc. Off. Anal. Chem.* 58(2): 233-235; 1975.

The report on chlorinated insecticides of subcommittee E of the Association of Official Analytical Chemists is presented. Recoveries of chlorobenzilate, chloropropylate, and acarol added to apples ranged from 91 to 117% at the 5.0 and 0.5 ppm levels. Additional work is recommended to find a practical procedure for forming chemical derivatives for residue identity confirmation of heptachlor and heptachlor epoxide. Other recommendations are made for studies on hexachlorobenzene and dicofol, determination of important organochlorine compounds in fish, polychlorinated biphenyls, toxaphene, and mirex. A study was completed on the determination of tetradifon, endosulfan, and tetrasul in apples and cucumbers.

75-1751. Yip, G. (Div. Chem. Technol., Food Drug. Admin., Washington, DC 20204). **Report on fungicides, herbicides, and plant growth regulators.** *J. Assoc. Off. Anal. Chem.* 58(2): 236: 1975.

The report on fungicides, herbicides, and plant growth regulators of Subcommittee E of the Association of Official Analytical Chemists is presented. The dithionite reduction method for spectrophotometric determination was studied by five laboratories. Potatoes, oranges, soybeans, and sugar cane were analyzed for paraquat; soybeans and sugar cane for diquat. The levels used were 0.5 and 5.0 ppm. The paraquat results showed average recoveries of 81-89%. There were analytical problems with the diquat experiment. The gas-liquid chromatographic method to improve cleanup and recoveries of endothal in various crops, soil, and water was modified. The following pesticides are among those recommended for study: amiben, amitrole, benzimidazole-type fungicides, captan and related fungicides, carbamate herbicides, dacthal, dichlobenil, dinitro compounds, diphenamid, dithiocarbamates, dyrene, picloram, succinic acid, trifluralin, and TCA. Other recommendations include resolving the problems associated with diquat and improving the methodology for maleic hydrazide.

75-1752. Corneliussen, P. E. (Div. Chem. Technol., Food Drug Admin., Washington, DC 20204). **Report on multiresidue methods (interlaboratory studies).** *J. Assoc. Off. Anal. Chem.* 58(2): 238-239; 1975.

Reports of interlaboratory studies on multiresidue methods for the analysis of pesticides are briefly summarized. Multiresidue methods for nonfat foods are being developed for dieldrin and heptachlor epoxide in eggs, and for DDE, DDT isomers, and parathion in kale. Chlorinated pesticides under study include endosulfan, endosulfan sulfate, tetradifon, and tetrasul. A gas-liquid chromatographic method was adopted for the determination of carbophenothion, carbophenothion oxygen analog, EPN, paraoxon, and parathion in apples and green beans. An official method is needed for the determination of chlorinated pesticides in meat and meat products. Seven organophosphorus compounds and 26 organochlorine compounds will be included in a report on recovery data obtained from routine fortification-recovery experiments on total diet composites over the past 4 yr.

75-1753. McCully, K. A. (Health Protect. Branch, Dep. Natl. Health Welfare, Ottawa, Ontario, Canada). **Report on phosphated pesticides.** *J. Assoc. Off. Anal. Chem.* 58(2): 240-242; 1975. (28 references)

Recent publications on methodology for the analysis of pesticide residues are reviewed. Gas-liquid chromatographic methods are summarized for the analysis of acephate, azinphosmethyl, chlorfenvinphos, chlorpyrifos, leptophos, diazinon, dioxathion, phosphamidon, triazophos, and pyrazophos. Other methods are summarized for acetonitrile, dichlorvos, parathion, fenitrothion, malathion, and Sephadex LH-20. Recommendations are made for developing methodology for chlorinated and phosphated pesticides and for the analysis of naled and dichlorvos.

75-1754. Brednner, K. S.; Mueller, K.; Sattel, P. (Untersuchungslab. BASF AG, Ludwigshafen, Germany). **Nachweis und Bestimmung von 2,3,7,8-Tetrachlordibenzo-*p*-dioxin in chlorsubstituierten Phenoxalkansaeuren. 2. Mitteilung. [Detection and determination of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in chlorine-substituted phenoxy alkanoic acids. Part 2.]** *J. Chromatogr.* 90: 382-387; 1974. (14 references) (German)

A method for the gas chromatographic determination of dioxin in 2,4,5-T and other phenoxyalkanoic acids is described. Following concentration by extractive distillation, dioxin is determined on a 60-m-long capillary column coated with Dexsil. The column is coated by pressing a plug of Dexsil solution through the capillary at constant speed to achieve a uniform separation phase. Comparison of this method with another consisting of extraction with *n*-hexane from dimethylformamide-acetonitrile-water solution, column chromatographic clean-up on alumina, thin-layer chroamtography on silica gel, and gas chromatography of the eluted dioxin zone on SE-30 with Chromosorb W-AW-DMCS shows the applicability of both methods, the advantages of the new method, and the possibility of combining the two.

75-1755. Houx, N. W. H.; Voerman, S.; Jongen, W. M. F. (Lab. Res. Insectic., Wageningen, The Netherlands). **Purification and analysis of synthetic insect sex attractants by liquid chromatography on a silver-loaded resin.** *J. Chromatogr.* 96(1): 25-32; 1974. (18 references)

A description is given of a reliable low-pressure liquid chromatographic system for the analytical and preparative separation of geometrical isomers of alken-1-ol acetates, which are used as insect sex attractants. Baseline separations of 1—600 mg in 1—6 hr on columns packed with a macroporous cation-exchange resin treated with silver nitrate are reported. These reusable columns are eluted with methanol and continuously monitored by a differential refractometer, which also allows quantitative analysis. (Author abstract by permission)

75-1756. Sherma, J. (Dep. Chem., Lafayette College, Easton, PA 18042). **Chromatographic analysis of fungicides.** *J. Chromatogr.* 113(1): 97-137; 1975. (215 references)

The separation and analysis of a wide range of fungicides by gas, liquid, column, paper, and thin-layer chromatography are reviewed. Major attention was given to methods for the identification and quantitation of individual and multiresidues of fungicides in environmental and agricultural samples. Only organic fungicides are included; these are classified as organomercury compounds, carbon disulfide-amine reaction products (dithiocarbamates), halogen-containing compounds, cationic compounds, and miscellaneous compounds. The literature of fungicide chromatography is covered through May 1974. Only those methods which appear most likely to give satisfactory results in practical analytical situations are included. The primary chromatographic method presently used in pesticide residue analysis is gas-liquid partition chromatography because of the availability of a series of sensitive and selective detectors for pesticide compounds containing halogen, phosphorus, sulfur, and nitrogen atoms. These detectors, which are applicable in fungicide analyses, include the relatively non-specific electron capture detector and the specific microcoulometric, flame photometric, alkali flame ionization, and electrolytic conductivity detectors.

75-1757. Elias, L. (Natl. Aeronautical Establishment, Natl. Res. Council, Ottawa, Ontario, Canada). **Airborne GC analyzer for study of pesticide vapor drift.** *J. Chromatogr. Sci.* 13(4): 178-181; 1975. (6 references)

A gas chromatograph equipped with an electron capture detector and a flame photometric detector was mounted on a Beech 18 aircraft as part of a program to study the vapor drift associated with pesticide spraying operations. Preliminary field trials included a weed control program in the Saskatchewan wheat belt and a series of spray operations for budworm control in the northern New Brunswick forest. Outside air was continuously drawn through a heated inlet tube and 10 cm^3 portions of the stream were injected into the partition column via a 6-port sampling valve. In field trials monitoring commercial spraying operations, the present instrumentation was capable of indicating concentrations as low as 1 $\mu g/M^3$ of the chlorinated herbicide, 2,4-D butyl ester, in less than 5 min. Bypassing the column and injecting air samples directly into the flame photometric detector allowed rapid (less than 20 sec) sensing of the phosphorus-containing insecticides fenitrothion and phosphamidon at concentration levels down to 50 $\mu g/M^3$.

75-1758. Minear, R. A.; Pagoria, P. S. (Dep. Civil Eng., Univ. Tennessee, Knoxville, TN). **Organics.** *J. Water Pollut. Control Fed.* 46(6): 1058-1100; 1974. (434 references)

This literature review covers the following areas under the general heading of pesticides: pesticide analysis techniques, toxicology, groundwater contamination, marine distribution, methods for determination, reviews of PCBs, hazards of impurities in chlorinated compounds, confirmation of hexachlorobenzene in the presence of hexachlorocyclohexanes, analysis of organochlorine pesticides, insecticide concentration in unfiltered water and sediments, seasonal variations in chlorinated hydrocarbon pesticide residues, plankton contamination, channel catfish contamination, conversion of chlorinated hydrocarbons by Hg lamp irradiation, fate of pesticides in an aquatic system, fate of pesticides in a model ecosystem, and the influence of soil organic matter on insecticides. Under the topic organophosphorus pesticides are included references on: analysis of metabolites in urine, analytical separation and isolation of parathion photoalteration products, field methods for evaluation of water contamination, residues in biota, effect of saturating cations and clay concentration on soil absorption, and microbial participation in metabolism. Under carbamates are included: soil analysis techniques, soil and plant residues, detection limits, irradiation products, and morphological and histological alterations in embryos. Under herbicides are listed: analysis in water and corn samples, concentrations in runoffs, adsorption and desorption by soils, photolytic decomposition, degradation, biological and chemical degradation, and the effects of various herbicides on the growth rates of various bacteria. Other pesticides are also included in the literature review.

75-1759. Puccetti, G.; Leoni, V.; Pana, A. (Ist. Ig. "G. Sanarelli", Univ. Roma, Rome, Italy). **Una teenica per la determinazione dell'attivita' anticolinesterasica nelle acque superficiali e potabili.** [**A technique for the determination of anticholinesterase activity in surface and drinking water.**] *Ig. Sanit. Pubb.* 29(3-4): 77-94; 1973. (19 references) (Italian)

A rapid technique for the determination of anticholinesterase activity in river and drinking water containing organophosphorus pesticides (parathion) is presented. The method is based on extraction of the water with benzene and determination of the antiChE activity in the extract using acetycholine chloride as substrate, horse serum as the enzyme source, and *m*-nitrophenol as pH indicator. The obtained data are expressed as "parathion equivalents" in relation to a standard cuve based on parathion. Also reported are results from analysis of some samples of surface and drinking waters, the results of recovery trials, and problems related to the "blank."

75-1760. Bobrova, V. I.; Bernatskaya, L. S. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers and Plastic Materials, Kiev, USSR). **Metod opredeleniya geksilura v vod, pochve i produktakh rastitel'nogo proiskhozhdeniya.** [**Determination of hexilur in water, soil, and products of plant origin.**] *Khim. Sel'. Khoz.* 10(9): 58-59; 1973. (2 references) (Russian)

A thin-layer chromatographic method for the determination of hexilur in water, soil and plant material is described. Following extraction with chloroform, the sample is applied to a chromatographic plate which is then placed in a chromatographic chamber containing an 8:1 ratio of chloroform and acetone. Following irradiation for 15 min., the plate is exposed to chlorine vapor to obtain chlorine derivatives of the photolysis products of hexilur, which are then visualized with *o*-tolidine. The sensitivity of the thin-layer chromatographic method amounts to 0.025 mg/liter in water, and 0.05-0.1 mg/kg in soil and plant materials. The mean *Rf* value lies at 0.52 ± 0.05.

75-1761. Knyr, L. L.; Sokolov, M. S. (Inst. Agrochem. Soil. Sci., Acad. Sci. USSR, USSR). **Sposoby kratkovremennoy konservatsii prob pochvy i vody, soderzhashchikh galoidfenoksikisloty i ikh toksichnyye metabolity.** [**Short-term preservation of soil and water samples containing halophenoxy acids and their toxic metabolites.**] *Khim. Sel. Khoz.* 12(3): 218-220; 1974. (2 references) (Russian)

A method for the preservation of water and soil samples containing halophenoxy acids, such as 2,4-D, MCPA, 2,4-dichlorophenol, and *n*-chloro-*o*-cresol is described. An aqueous solution of sodium chloride containing sodium hydroxide is recommended for the short-term preservation of soil samples. Drying the soil sample may result in a pesticide loss of 60-70%. Water samples can be preserved with toluene at pH 11 or propiolactone at pH 1.

75-1762. Balashova, Ye. K.; Pevzner, D. L.; Rozengart, V. I.; Sherstobitov, O. Ye. (Dept. Appl. Biochem., I. M. Sechenov Inst. Evolut. Physiol. Biochem., USSR). **Opredeleniye gidrofobnykh fosfororganicheskikh ingibitorov kholinesterazy v krovi.** [**Determination of hydrophobic organophosphate cholinesterase inhibitors in blood.**] *Lab. Delo.* 12: 719-720; 1974. (8 references) (Russian)

A highly sensitive method for the determination of hydrophobic organophosphate cholinesterase inhibitors in blood is described. The blood sample to be analyzed is hemolyzed and combined with water, after which chloroform is added for extraction. Chloroform is evaporated, and the cholinesterase inhibitor is determined by incubation with standard cholinesterase at 37°C for 1 hr, after which the residual cholinesterase activity is determined under standard conditions according to Hestrin's method, using acetylcholine for incubation at 30°C. The method, developed for *O* - methyl - *S* - *n* - hexyl - methylthiophosphonate (GA-89) and *O* - ethyl - *S* - (β - ethylmercaptoethyl) - methylthiophosphonate (GD-7), is suitable for the detection of these substances in concentrations of 10 nmol/ml and 0.4 nmol/ml, respectively.

75-1763. Malkus, Z. (Res. Dep. Food and Nutr. Hyg., Inst. Hyg. Epidemiol., Prague, Czechoslovakia). **Anwendung der Polarographie und der oszillographischen Polarographie mit Wechselstrom in der Lebensmittelanalyse.** [**Application of polarography and oscillographic**

polarography with alternating current to food analysis.] Nahrung 18(3): 323-328; 1974. (60 references) (German)

The applications of polarography and a.c. oscillographic polarography to food analysis are reviewed. Samples to be analyzed by polarography are ashed primarily by the wet incineration technique. Residues of DDT in foods are determined following nitration of the DDT molecule. Parathion, trichlorfon, methyl parathion, potasan, and BHC can be determined by polarographic method, while parathion and some of its oxidation products can be determined by combined chromatographic and polarographic method. Bismuth, tin, cadmium, and zinc in foods can be determined by oscillographic polarography.

75-1764. Kanazawa, J.; Masuda, T. (Nat. Inst. Agric. Sci., Tokyo, Japan). [**Analytical methods for determining pesticide residues in soil and crops, IV.**] *Nippon Dojo Hiryogaku Zasshi (J. Soil Anim. Fertil)* 44(11): 448-460; 1973. (111 references) (Japanese)

An analytical method of determining pesticide residues in soils and crops is described for organochlorine insecticides, methomyl, nicotine, kelthane (dicofol), chlorobenzilate, tetradifon, and metal-containing pesticides. In the general method for organochlorine insecticide analyses, sample soils or crops are extracted with an organic solvent and the extract is concentrated by column chromatography. If suitable procedures are used to eliminate interfering compounds for the determination, such as a copper powder treatment for sulfur removal, the final analyses can be made on a gas chromatograph equipped with an EC detector. Other non-chlorinated insecticides are also analyzed by techniques similar to those for organochlorine insecticides. Metal-containing pesticides are analyzed by atomic absorption spectrometry or colorimetry following acid digestion of sample soils or crops. Atomic absorption spectrometry is applicable for the direct determination of copper, lead, and zinc-containing pesticides. The lead based pesticides can also be determined by colorimetry using the dithizone extraction technique. Arsenic and tin based pesticides are determined by complexation with silver diethyldithiocarbamate and phenylfluorone respectively, and the absorption of their red complexes is measured at 525 nm and 520 nm respectively. Metallic mercury in soils or crops is determined by atomic absorption spectrometry, but organomercury compounds are determined by gas chromatography after acid digestion and extraction.

75-1765. Kanazawa, J.; Masuda, T.; Iizuka, H.; Yamada, T.; Suzuki, T. (Nat. Inst. Agric. Sci., Tokyo, Japan). [**Analytical metods for determining pesticide residues in soil and crops, V.**] *Nippon Dojo Hiryogaku Zasshi (J. Sci. Soil Anim. Fertil)* 44(12): 491-502; 1973. (138 references) (Japanese)

An analytical method for determining pesticide residues in soils and crops is described for organosulfur insecticides (thiram, ziram, ferbam, nabam, zineb, and maneb), synthetic organic insecticides (difolatan, captan, folpet, PCNB, and dichlone), herbicides (2,4-D, 2,4,5-T, PCP, nitrofen, CNP, benthiocarb, swep, simazine, propazine, atrazine, paraquat, and 2,6-DBN), and plant growth regulators. Other analytical methods included are for methyl bromide, ethylene dibromide, chloropicrin, and 1,3 dichloropropene. Except for organosulfur insecticides and paraquat, all can be determined by a gas chromatograph equipped with an EC detector. Sample soils or crops are extracted with a suitable organic solvent and concentrated for GC analysis. The concentration process is generally performed by column chromatography with an appropriate developing solvent. Esterification is used for the determination of 2,4-D, 2,4,5-T, and MCPA. Colorimetric determination is generally used for the organosulfur insecticides and paraquat analyses. The carbamic acid insecticides can also be determined by measuring the carbon disulfide liberated upon decomposition of carbamic acids using GC.

75-1766. Owai, S.; Oki, N.; Murakami, E. (Taito Pfizer Co., Ltd., Tokyo, Japan). [**Determination of residues of oxytetracycline in crops by column chromatography using a non-ionic porous adsorptive resin. Part 1.**] *Noyaku Kagaku (J. Pestic. Sci.)* 2(4): 186-189; 1975. (5 references) (Japanese)

To determine the residues of oxytetracycline (OTC) in crops to which a mixed formulation consisting of OTC and streptomycin had been applied, cleanup procedures by column chromatography using nonionic porous adsorptive copolymer and bioassay procedures by plate diffusion methods using *Bacillus cereus var. mycoides* ATCC 11778 as a test microorganism were examined. It was found that cleanup using Amberlite XAD-2 was effective in isolating OTC from peaches. Recovery of OTC added at 1 ppm was 85% with a minimum detectable concentration of 0.04 ppm. It was further found that toluene was effective for removing certain interfering substances from peach, chinese cabbage, citrus juice, and potato; however, the variety, maturity, and type of pesticide formulation used on Chinese cabbage, citrus, and potato were critical factors in removing the interfering substances. Such substances in onion could not removed by the preset method. Streptomycin residues in crops could be removed by clean-up procedure with the Amberlite.

75-1767. (Agr. Chem. Inspection Stn., (Min. Agric. Forest., Tokyo, Japan). [**Official methods of inspecting agricultural chemicals, Part. 28. BPMC (2-*sec*- butylphenyl *N*-methylcarbamate) EC and Cartap WP.**] *Noyaku Kagaku (J. Pestic. Sci.)* 2(4): 190-191; 1975. (Japanese)

Official methods of determining the active ingredient content in BPMC EC (Osbac) and Cartap (*S,S*-[2-(dimethylamino)trimethylene] bis (thiocarbamate)) WP according to Notice No. 1390, Ministry of Agriculture and Forestry (July 3, 1973) are presented in detail. The principle used in determining BPMC consists of dissolving the BPMC in acetone, chromatographing on a thin layer with hexane-ethyl acetate as developing mixture, scraping off the dark purple spot (under UV), dissolving in methanol, hydrolyzing with KOH, and obtaining the absorption max.

at 515 nm after adding *p*-nitrobenzene diazonium fluoroborate. The principle for determining Cartap consists of extracting with methanol, adding 5,5-dithiobis (2-nitrobenzoic acid) as color reagent, adding a buffer solution comprising phosphoric, boric, and acetic acids and NaOH at pH 9.0, and obtaining the absorption max. at 412 nm.

75-1768. Takeda, A. (Nat. Inst. Hyg. Sci., Min. Health Welfare, Tokyo, Japan.) [**Methods for pesticide residues for which standards in foods and food additives have been established. Organophosphorus pesticides.**] *Noyaku Kagaku (J. Pestic. Sci.)* 2(4): 193-199; 1975. (5 references) (Japanese)

Officially established methods of determining pesticide residues on and in foods were explained; parathion, malathion, EPN, dichlorvos, dimethoate, fenitrothion, phenothoate, fenthion, and diazinon were studied. These pesticide residues on and in rice, other cereals, and legumes after extraction were partitioned with *n*-hexane and acetonitrile, and the aetonitrile layer was extracted with benzene. The benzene layer was applied to an activated charcoal column, then eluted with acetone. The acetone solution was gas-chromatographed to determine and identify the pesticide content. These pesticide residues on and in vegetables and fruits are determined by methods previously described (see abstract no. 75-1228). Detailed precautions and the reasons for these precautions were described.

75-1769. Tomita, M.; Someya, N.; Sakama, H.; Nishimura, M. (Sch. Hyg. Tokyo Dental College, Tokyo, Japan). [**Quantitative determination of organophosphorus pesticides in blood. Part 2. Inhalation toxicity of pyridafenthion (Ofnac) to rat.**] *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 30(1): 122; 1975. (Japanese)

Fifty male JCL Wistar rats weighing 100-120 g were divided into five equal groups. Groups I and II were exposed for one hr to pyridafenthion (*0,0* - diethyl - *0* - (3 - oxo - 2 - phenyl - 2H - pyridazin - 6 - yl) phosphorothioate vapor from 5% and 10% diethyleneglycol. Blood collected from group I rats 0.5, 1.3, 6 and 24 hr after inhalation contained respectively 0.049 0.020 0.005 0.003 and 0.002 μg/ml. Corresponding figures were 0.108, 0.041, 0.023, 0.004, and 0.002 μg/ml for group II. Groups IV and V were exposed to pyridafenthion vapor (187.7 and 280.7 mg/m², respectively) one hr per day, 5 days a week for 26 days. They were killed on the 26th day after blood sampling. The pyridafenthion concentration, inhibition of plasma ChE activity, and serum ChE inactivation in these groups respectively averaged 0.020 and 0.065 μg/ml, 32.67 and 19.84%, and 22.01 and 17.64%. The concentration of pyridafenthion was determined by GLC with FPC using a 1-m column of 3% OV-17/Chromosorb W/AW DMCS at pyridafenthion.

75-1770. Tsuge, S.; Hanzawa, T.; Suzuki, K.; Kashiwa, T. (Agric. Chem. Insp. Stn., Tokyo, Japan). [**Gas-liquid chromatographic determination of a fungicide, dichlofluanid (Euparen), in wettable powder formulation.**] *Noyaku Kensasho Hokoku (Bull. Agric. Chem. Insp. Stn.)* 14: 19-20; 1974. (Japanese)

A method of determining dichlofuanid (*N* - dichlorofluoromethylthio - *N,N* - dimethyl - *N* - phenylsulfamide) in formulations which is simpler and more rapid than the method already registered was proposed. A calibration curve was prepared by gas chromatograpy of an acetone solution of authentic dichlofluanid containing β-naphthyl phenyl ketone as internal standard, obtaining the ratio of peak areas of the two compounds. The specimen was extracted with acetone after adding the internal standard, and the extract was gas chromatographed using Silicone SP-2401 3%/Gaschrom Q and FID. By comparing the ratio of peak areas of the two compounds and referring to the calibration curve, the content of dichlofluanid in the formulation was determined. The recovery from freshly prepared formulations was 99.6%, and the use of the present method on commercial Euparen wettable powder resulted in a standard deviation of 0.7%.

75-1771. Suzuki, S.; Sekiguchi, Y.; Suzuki, K.; Etsuchu, T.; Kashiwa, T. (Agric. Chem. Insp. Stn., Tokyo, Japan). [**Determination of pesticide in pesticide-impregnated paper bags.**] *Noyaku Kensasho Hokoku (Bull. Agric. Chem. Insp. Stn.)* 14: 21-24; 1974. (6 references) (Japanese)

A systematic method for separating and determining pesticides on bags made of paper impregnated with pesticides and used for protecting fruits on trees was devised. The pesticides were separated into 4 groups by TLC: organochlorine pesticides in the first and second groups, organophosphorus pesticides in the second and third groups, and captafol, captan, and carbamates in the fourth group. Individual pesticides in each group were identified by gas chromatography. To separate pesticides from paraffins and oils also impregnated into the bags in large amounts, a low-temperature cleanup procedure developed by DeFaubert, Maunder et al. was utilized. Copper-containing pesticides in the bags were examined by atomic absorption analysis. The above mentioned methods were utilized in combination to determine pesticides in commercial paper bags for protecting fruits on trees. Results of analyses of bags which had been actually used for this purpose revealed that about 50% of the impregnated fenitrothion and tetrachloroisophthalonitrile had disappeared.

75-1772. Ishii, Y.; Tsuge, M.; Nakamura, H. (Agric. Chem. Insp. Stn., Tokyo, Japan). [**Studies on the microanalysis of *N*-methylcarbamate insecticides. Part 4. Carbaryl residues in vegetables.**] *Noyaku Kensasho Hokoku (Bull. Agric. Chem. Insp. Stn.)* 14: 25-30; 1974. (5 references) (Japanese)

Conditions for gas chromatographic analysis of residue of carbaryl as 1-naphthyl monochloroacetate were examined. Residues of carbaryl on and in lettuce, cucumber, and tomato intentionally adulterated with carbaryl were determined by the best method found. The method comprised extracting carbaryl with methanol, cleaning up by coagulation, oxidation to remove

1-naphthol formed by metabolism of carbaryl, and Florisil column chromatography in that order, followed by gas chromatography with 3% Silicone OV-225. The method gave the following results: 84.5% recovery in/on cucumber treated with 0.1 ppm, 84.7 and 84.0% in/on tomato respectively treated at 0.06 and 0.1 ppm, and 76.0 and 88.5% in/on lettuce respectively treated at 0.1 and 0.2 ppm. Washing with neutral detergent removed 60-80% of applied carbaryl on tomato and 10-20% on cucumber. The carbaryl residue level determined by colorimetry was about 10% higher than that determined by the present gas chromatography.

75-1773. Watanabe, T.; Kobayashi, N.; Haga, J. (Agric. Chem. Insp. Stn., Tokyo, Japan). [**Residue analysis of metals in crops. Part 1. Comparative examination of analyses by several instruments on lead and copper.**] *Noyaku Kensasho Hokoku (Bull. Agric. Chem. Insp. Stn.)* 14: 31-37; 1974. (3 references) (Japanese)

The recovery of lead and copper from pesticides applied to cucumber, at 20, 60, and 100 μg per 20 g was investigated by atomic absorption spectromphotometry, alternating current polarography, and oscillographic polarography. According to the results, the recovery of lead by a.c. polarography and the recovery of copper by osciollpolarography using 0.1 *M* aqueous hydrochloric acid solution as supporting electrolyte were excellent (110, 106.5 and 103% for lead, and 100, 118 and 96% for copper). The recovery of lead and copper by atomic absorption spectrophotometry was comparatively good when using 0.1 *M* aqueous perchloric acid solution. Analyses of market crops such as cucumber, spinach, and apple revealed that although in the case of higher lead residues (over 0.8 ppm) the results by all three methods were good, in the case of lower values atomic absorption spectrophotometry gave more reliable data, and there was a moderately large difference between the values obtained by the three methods for the copper residues.

75-1774. Baba, Y. (Agric. Chem. Insp. Stn., Tokyo, Japan.) [**Determination of streptomycin residues in plants. Part 3. Vegetable crops.**] *Noyaku Kensasho Hokoku (Bull. Agric. Chem. Insp. stn.)* 14: 42-45; 1974. (5 references) (Japanese)

A bioassay method was developed for streptomycin residues in pulp of peach and Satsuma orange, peel of the same, tubers of *Amorphophalus konjac*, and tomato using *Bacillus subtilis* ATCC6633 in paper disc - agar plate culture. Extraction and cleanup followed previous methods (see abstract No. 73-2523). However, the adsorbent used was IRC-resin (Na-type), and the eluant was hydrochloric acid. The results were: recovery from treated peach pulp (at 0.125 and 0.2 ppm) was 72 and 78% with a detection limit of 0.005 ppm; recovery from treated *A. konjac* (12.5 mg per 100 g) was 76 and 80% with a detection limit of 0.005 ppm; that from treated peel of Satsuma orange (12.5 %g per 50 g) was 76% with detection limit of 0.01 ppm; that from treated tomato (25 μg per 100 g) was 85% with detection limit of 0.01 ppm when Sephadex G-25 was used in cleanup. Results of a preliminary analysis in cabbage were described. *Bacillus natto* Sawamura IFO 3010 was found not appropriate for the bioassay of streptomycin in crops tests.

75-1775. Ishitani, A.; Yukimoto, M.; Yoshida, K. (Agric. Chem. Insp. Stn., Tokyo, Japan). [**Bioassay of gibberellin in the formulation using Waito-C, a dwarf of *Oryza sativa*.**] *Noyaku Kensasho Hokoku (Bull. Agric. Chem. Insp. Stn.)* 14: 46-48; 1974. (2 references) (Japanese)

Seedlings of Kimmaze, a cultivar of *Oryza sativa*, are often utilized for bioassay of gibberellin (GA3) in formulations. However, it was found that seedlings of Waito-C, a dwarf of another cultivar of *O. sativa* were more sensitive than Kimmaze. Therefore studies were carried out on the effect of McIlvaine's phosphate-citric acid buffer solution on the results of the bioassay when Waito-C was utilized as the test plant. It was found that the maximum concentration and volume of the buffer which did not inhibit the growth of the seedlings and the pH which provided for maximum sensitivity to gibberellin (GA3) were almost the same as those on Kimmaze. In the case of Waito-C, disodium phosphate and citric acid concentrations of respectively 0.04 *M* and 0.002 *M*, a buffer solution volume of 20 ml per dish, and a pH of 4.0 were most appropriate for the bioassay of gibberellin (GA3).

75-1776. Okada, T.; Matsutani, S.; Imamura, K.; Yoshida, K.; Tanaka, N. (Agric. Chem. Insp. Stn., Tokyo, Japan). [**Method of determining the content of an active ingredient, *Dendrolimus spectabilis* cytoplasmic polyhedrosis virus, in its formulation (WP).**] *Noyaku Kensasho Hokoku (Bull. Agric. Chem. Insp. Stn.)* 14: 97-102; 1974. (Japanese)

The spherical granular virus containing RNA and proliferating in the cytoplasm of mesogastric cylindrical cells of *Dendrolimus spectabilis* larvae is officially called DCV. It is officially registered as a pesticide against its host, *D. spectabilis*. The standard DCV titer is designated as the effectiveness of 0.14 μg of the virus granules against 6th instar larvae of *D. spectabilis*. The method of determination is based on a bioassay using *D. spectabilis* 6th instar larvae as biological indicator, inoculated with DCV at 25 ± 1°C. The level of infection is examined on surviving larvae and pupae on the 7th day after inoculation, and the effectiveness (titer) is obtained from a relationship: the percentage of infection equals the sum of the logarithm of effectiveness (titer) multiplied by constants. Detailed methods of procedure and calculation as well as the methods of rearing *D. spectabilis* were described.

75-1777. Tomita, M.; Someya, N.; Nishimura, M.; Ueda, K. (Sch. Hyg., Tokyo Dent. Coll., Tokyo, Japan). [**Studies on the residue of organophosphorus pesticides in living organisms, especially on the gas chromatographic determination of fenitrothion (*O,O*-dimethyl *O*-(3-methyl-4-nitrophenyl)phosphorothioate) in blood.**] *San-*

gyo Igaku (Jpn. J. Ind. Health) 16(6): 547-556; 1974. (23 references) (Japanese)

A method for micro-determination of fenitrothion in blood by GC with FPD was studied. The determinations were carried out on blood specimens from normal persons and beagles which had been administered fenitrothion p.o. in a long-term toxicity study. Because impurities in reagents such as sodium sulfate and contaminants in filter papers, column packings, and glassware used for extraction and cleanup produced occasionally serious interfering peaks, thorough acetone washing of such articles was necessary. Ethyl acetate was effective for extraction without requiring dehydration of the specimen or column chromatographic cleanup. Three kinds of columns, DC-200 plus QF-1(1:1), 2% OV-17, and 5% DEGS gave good separation of organophosphorus pesticides. In blood specimens from normal persons some peaks corresponding to some organophosphorus pesticides which appeared in the column disappeared on other columns, suggesting the presence of artifacts in the blood of normal persons. When the method was applied to the blood of beagles treated chronically, the residual amount of fenitrothion was around 0.001 μg/ml, i.e., below the lower limit of detection.

75-1778. Miyata, H.; Kashimoto, T. (Osaka Prefect. Inst. Public Health, Osaka, Japan). [**Studies on an analytical method for carbamate insecticide residues in vegetables and fruit.**] *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 15(6): 485-490; 1974. (10 references) (Japanese)

A method is presented for determining residual amounts of five carbamete insecticides. The test substances were: 3-methylphenyl *N*-methylcarbamate (MTMC), 2-chlorophenyl *N*-methylcarbamate (CPMC), 2-*sec*-butylphenyl *N*-methylcarbamate (BPMC), 3,4-dimethylphenyl *N*-methylcarbamate (MPMC), and 1-naphthyl *N*-methylcarbamate (NAC, carbaryl). The procedure consists of benzene extraction, cleanup on florisil and charcoal columns, and trifluoroacetylation. Trifluoroacetylated carbamates are measured by electron-capture gas chromatography and can be separated from each other on a 5 foot glass column packed with GasChrom Q coated with 3.5% OV-17. The method is used for potato, orange, Chinese cabbage, burdock, loquat, melon cucumber, and komatsuna. In vegetables and fruits, the limits of detection are 0.01 ppm for MTMC, CPMC, and BPMC, and 0.03 ppm for MPMC and NAC.

75-1779. Kojima, T.; Ichise, M.; Seo, Y. (Dep. Ind. Chem., Fac. Eng., Kyoto Univ., Sakyo-ku, Kyoto-shi, Japan). [**Selective gas chromatographic detector using ion-selective membrane electrode. III. Selective detection of nitrogen compounds using a cation-sensitive glass electrode.**] *Bunseki Kagaku (Jpn. Anal.)* 22(2): 208-213; 1973. (7 references) (Japanese)

Described are the design and performance of a selective gas-chromatographic detector capable of analyzing pesticide mixtures containing nitrogenous components. The principle of detection is based on the conversion of nitrogen to ammonia and then the continuous monitoring of ammonia absorbed in an absorption solution. Detection is by means of a monovalent cation-sensitive glass electrode which prevents any interference from other common elements. In the analysis of a pesticide mixture comprising solvent, BHC, diazinon, heptachlor, aldrin, and dieldrin, a full scale response was obtained for diazinon, while other pesticides containing chlorine and oxygen were not detectable.

75-1780. Horiba, M.; Kitahara, H.; Murano, A. (Takarazuka Res. Lab., Sumitomo Chem. Co., Ltd., Takarazuka-shi, Hyogo, Japan). [**Analytical studies on pesticides and related compounds. XXIV. Determination of 2,2-dichlorovinyl dimethyl phosphate in insecticidal oil solutions by flame photometric gas chromatography.**] *Bunseki Kagaku (Jpn. Anal.)* 22(5): 595-597; 1973. (12 references) (Japanese)

By the utilization of gas chromatography with a flame photometric detector (FPD), a quantitative method for the determination of 2,2-dichlorovinyl dimethyl phosphate (DDVP, dichlorvos) in insecticidal oil solutions has been developed. Problems were encountered when a hydrogen flame ionization detector was used as some of the peaks derived from kerosene in the oil solutions overlapped with the peak of DDVP and interfered with the determination of DDVP. With FPD (filter: 526 nm), which is highly sensitive and selective for phosphorus compounds, the peaks from kerosene were not detected, and DDVP could be determined precisely with a coefficient of variation of 1.71% by utilizing *O,O,S*-trimethyl dithiophosphate as the internal standard. The operational conditions were: apparatus, Shimadzu GC-5A with FPD (filter 526 nm); glass column, 1.5 m long, 3 mm internal diameter, column packing, 60-80 mesh, acid-washed and silanized Chromosorb W coated with 2% polyethylene glycol-20 M (PEG-20 M); column temperature, 125°C; injection temperature, 200°C; carrier gas, nitrogen 35 ml/min; detector gases, hydrogen 200 ml/min and air 60 ml/min. Under these conditions the retention times for DDVP and for *O,O,S*-trimethyl dithiophosphate should be about 6.0 mi and 3.2 min, respectively.

75-1781. Takano, T. (Tech. Div., Jpn. Insectic. Ind. Assoc., Tokyo, Japan). [**Estimation of allethrin in mosquito coils.**] *Bocku-Kagaku (Sci. Pest. Contr.)* 39: 96-103; 1974. (11 references) (Japanese)

A method is reported for the gas chromatographic determination of allethrin (3 - allyl - 2 - methylcyclopent - 2 - en - 4 - on - 1 - yl - *dl* - *cis*, - *trans* - chrysanthemate) in mosquito coils. The determination of technical allethrin by gas chromatography was initially studied. β - Naphthoquinoline was added (as an internal standard) to about 100 mg of technical allethrin. Secondly, the extraction of allethrin from mosquito coils was investigated. Insecticidal pyrethroids have usually been extracted with acetone from mosquito coils, but allethrin was not com-

pletely extracted with this solvent. The highest recovery of allethrin was obtained with the use of methanol as the solvent. More than 95% of the theoretical content of allethrin was obtained in the following way: 3-5 grams of powdered coil (80% passing through 100 mesh) were extracted with 100-120 ml of methanol for 4 hours in a water bath at 85-90°C by Soxhlet extractor. Ethyl or methyl stearate was added as an internal standard, the solvent was removed in vacuo, and residual matter was dissolved in methanol:acetone (1:1) mixture. The allethrin was subsequently determined by gas chromatography. Under these conditions, the gas chromatograms of coil base extracts and synergists had no influence upon the determination of allethrin.

75-1782. Piedade, J. R.; Vasques, R. M. P.; Matsungag, A. K. (Sec. Quim. Inst. Biol., Sao Paulo, Brazil). **Comparacao de dois sistemas para calculo em analise quantitative por chromatografia de gas. [Comparison of two calculation systems in gas chromarographic quantitative analysis of pesticides.]** *Biologico* 38(10): 361-362; 1972. (4 references) (Portuguese)

Parathion (2%), dimethoate (50% and 84%), heptachlor (72%), and lindane (100%) were used to compare two systems of injecting samples in quantitative analysis by gas-liquid chromatography. In the traditional method, a series of diluted standards is injected into the chromatograph, and the resulting peak areas are used to plot a calibration curve on which the sample quantity is located. The rapid method employs an external standard which is handled in the same manner as the sample, then injected alternately onto the chromatograph. A simple proportionality calculation will then give the pesticide content of the formulation tested. Results using the simple method compared favorably with the more complicated procedure, with differences between the two methods of 0.02% to 2.4% and absoulte errors of 0 to 7.1%.

75-1783. Ilie, C.; Cojocaru, L. (Inst. Cercet. Proiect. Aliment., Bucharest, Romania). **Contributii cu privire la extractia pesticidelor din produsele de carne in vederea determininarii lor prin cromatografie in faza gazoasa. [Contributions regarding pesticide extraction from meat products.]** *Lucr. Cercet. Inst. Cercet. Proiect Aliment.* 9: 207-212; 1972. (10 references) (Romanian)

A comparative study was conducted to detect organochlorine pesticide residues (HCH, DDE, DDT, and dieldrin) by gas chromatography with electron capture. Three different extraction methods were used: petroleum ether extraction by centrifuging the petroleum ether, Soxhlet extraction, and acetonitrile extraction by turmixing. The best results were obtained by the first two extraction methods. Values determined were over the ranges 0.123 to 0.015 ppm for HCH, 0.009 to 0.004 ppm for DDE, and 0.047 to 0.012 ppm for DDT.

75-1784. Riva, M.; Carisano, A.; Daghetta, A. (Lab. Ric. "Star" SpA, Agrate Brianza, Italy). **Determinazione rapida GLC di residui di antiparassitari cloro-organici e di policlorodifenili (PCB) in alimenti di origine animale - Considerazioni sullo stato di contaminazione dell'ecosistema. [Rapid GLC-ECD determination of chloro-organic pesticides and polychlorobiphenyls (PCB) residues in animal foods. General considerations about ecological contamination.]** *Riv. Ital. Sostanze Grasse* 50(12): 434-442; 1973. (10 references) (Italian)

A rapid GLC-ECD analytical technique is given for the separation of chlorinated pesticide residues from edible fats. Interference due to polychlorobiphenyls (PCB) in the qualitative and quantitative evaluations are underlined. A micro-method for dehydroclorination of DDT, DDD and BHC is proposed for the discrimination of responses of PCB's from pestcide residues. Analytical results concerning HCB, BHC, heptachlor epoxide, dieldrin, DDE, DDT, and PCB in cheese and other foods of animal origin are presented.

75-1785. Wozniak, J.; Tokarz, A. (Inst. Biofarm., Akad. Med., Warsaw, Poland). **Termojonowy detektor w chromatograficznych badaniach pestyydow fosforoorganichznych. [Thermionic detector in chromatographic determinations of organic phosphorus pesticides.]** *Rocz. Panstw. Zakl. Hig.* 25(3): 375-381; 1974. (6 references) (Polish)

The properties of a thermionic detector applied to the chromatographic analysis or organic phosphorus pesticides are described. A Pye-Unicam gas chromatograph model 104 with glass columns packed with the support Gas Chrom Q and SE-30 stationary phase was used. The flame ionization detector was sensitized with salts of alkaline compounds (CsBr, KBr, CsCl and KCl). The degree of its sensitivity to the model substance DDVP (dichlorvos) was determined by the type of salt and the temperature of the hydrogen flame (hydrogen flow rate). Construction of the press used for making proper rings of these salts, which were placed in the end-piece of the thermionic detector, is described. Experimentation demonstrated that the sensitivity and reproducibility of the signals from the detector depended on achieving optimum equililbrium between hydrogen flow rate (temperature of the flame in the detector) and the concentration of vapors of the sensitizing salt in the interelectrode space.

75-1786. Piechocka, J. (Inst. Food Res., Natl. Inst. Hig., Warsaw, Poland). Metoda oznaczania skladnikow czynnych gamakarbatoxu w ziemniakach. **[Determination of the active ingredients of gamma-carbetox in potatoes.]** *Rocz. Panstw. Zakl. Hig.* 26(1): 81-86; 1975. (10 references) (Polish)

A method of determining lindane and carbaryl in potatoes is proposed. A mixture of petroleum ether and methylene chloride (3:1) was used for extraction of insecticides. Extracts were then purified in a column with aluminum oxide and the residues of both pesticides determined by the method of thin layer chromatography on one chromatographic plate covered with silica gel. The solvent mixture used was *n*-hexane, ethyl acetate and acetone (9:1:1). The enzymatic method (Rf = 0.15) was used for

developing carbaryl spots and a solution of diphenylamine (Rf = 0.63) was used for lindane.

75-1787. Fitak, B.; Gwiazda, J. (Zakl. Bromatol., Inst. Biofarm., Acad. Med., Warsaw, Poland). **Oznaczanie DDVP metod kolorymetryczna i fluorymetryczna w preparatach wysokoprocentowych i czesciowo rozlozonych. [Determination of DDVP by the colorimetric and fluorometric methods in high-concentration and partly decomposed preparations.]** *Rocz. Panstw. Zakl. Hig* 26(1): 93-99; 1975. (11 references) (Polish)

DDVP (dichlorvos) was determined by the colorimetric method with resorcind in aqueous solution and by the fluorometric method with indole in acetone solution. It was found that the colorimetric method gives more accurate and reproducible results (± 0.88 to ± 2.55%) than the fluorometric method (± 1.65 to ± 7.33%). The latter, however, has a much lower detectability threshold (2 μg). In the partly decomposed DDVP preparation, the colorimetric method permitted the determination of DDVP in the presence of decomposition products.

75-1788. Beard, W. E.; Guenzi, W. D. (USDA, ARS, Western Region, Fort Collins, CO 80522). **Microcombustion method for the determination of carbon-14-labeled pesticide residues in soil.** *Soil Sci. Soc. Amer. Proc.* 39: 63-65; 1975. (5 references)

A dry combustion procedure commonly used for total carbon analysis was modified and used to determine the concentration of ^{14}C-labeled pesticides in soil. Modifications included replacement of the Ascarite CO_2 trap with a solution of an organic base compatible with liquid scintillation solvents, and minor carrier gas flow changes. Recovery of three pesticides was tested. The average recovery ranged from 83% for DDT in the Valentine loamy sand to 99.2% for lindane in the Promise clay. In general, lower recoveries were found in the light-textured soils and highest recoveries in the heavy-textured soils. The clay content increased in this series of selected soils as well as the organic matter content. Thus, the higher recoveries appeared directly related to clay or organic matter content of the soil or to both. However, recoveries of 92 to 100% can be expected from most soils. The procedure should also be effective for other pesticides. This method of recovering a ^{14}C tag has proven valuable in providing a method for following the fate of a pesticide in soil.

75-1789. Mestres, R.; Tourte, J.; Campo, M.; Illes, S. (Fac. Pharm., Lab. Chim. Appliq. Expert., Montpellier, France). **Note sur la technique de dosage des residus de benomyl dans les fruits et les legumes. [Determining benomyl residues in fruits and vegetables.]** *Trav. Soc. Pharm. Montpellier* 34(4): 367-369; 1974. (2 references) (French)

Minor modifications of the clean-up technique for spectrophotometric determination of benomyl and thiophanate in fruits and vegetables, introduced to increase the rate of recovery and to expedite the analysis, are described. Following extraction of benomyl with ethyl acetate, the ethyl acetate extract is washed with normal sodium hydroxide solution saturated with ethyl acetate. The rate of recovery amounts to 85%. For the determination of thiophanate following cyclization, the dry residue of the ethyl acetate extract is dissolved in dimethylformamide and concentrated ammonia.

75-1790. Maksudov, A. M.; Tadzhibayev, Yu.; Akramov, S. T. (Order of Labor Red Banner Inst. Phytochem., Acad. Sci. Uzb. SSR, USSR). **Kolorimetricheskiy metod opredeleniya fosfora v fosfororganicheskikh soyedineniyakh. [Colorimetric determination of phosphorus in organophosphorus compounds.]** *Uzb. Khim. Zh.* 17(1): 16-18; 1973. (9 references) (Russian)

A simple, reliable colorimetric method for the determination of phosphorus in organophosphorus pesticides is described. The sample to be analyzed is subjected to wet washing with sulfuric acid and nitric acid, after which the mineralized sample is further heated to expel all residues of nitric acid. The resulting residue, containing phosphomolybdic acid obtained by the reduction of phosphomolybdenum complex, is measured colorimetrically with a red filter for determination of the optic density. The absolute error of the method was found to be in a range of −0.30 to +0.19%.

75-1791. Mirkhaitov, T.; Ikramov, L. T. (Tashkent Inst. Pharmaceut., Tashkent, USSR). **Ekstraktsiya fozalona i ftalofosa iz vodnykh rastvorov organicheskimi rastvoritelyami v zavisimosti ot pH sredy. [Extraction of phosalone and phthalophos from aqueous solutions by organic solvents as a function of pH of the medium.]** *Uzb. Khim. Zh.* 18(1): 32-35; 1974. (8 references) (Russian)

The extraction of phosalone and phthalophos from aqueous solutions for subsequent colorimetric determination by the phosphomolybdenum blue method was studied at different pH values. Phosalone was extracted with chloroform, dichloroethane, ethyl ether, *n*-butanol, benzene, and toluene from both acid and alkaline solutions. However, it was not extracted by petroleum ether. The rate of extraction was highest, with 85-95%, at pH 1-5, and 94% at pH 1. Petroleum ether was found to be best for the extraction of phthalophos. The rate of extraction was 95% at pH 1 and 12% at pH 11.

75-1792. Iwaida, M.; Kaneda, Y.; Yamaji, A. (Natl. Inst. Hyg. Sci., Osaka Branch, Osaka, Japan). **[Analytical studies on pesticides by gas chromatograph with flame photometric detector. III. Determination of organophosphorus insecticides in sulfur-containing samples.]** *Yakugaku Zasshi (J. Pharm. Soc. Jpn.)* 94(9): 1178-1180; 1974. (7 references) (Japanese)

In the analysis of residual organophosphorus insecticides in vegetables by gas chromatograph equipped with a flame photometric detector, sulfur-containing substances often cause interference. Elimination of such interference required clean-up by florisil column chromatography and the selection of optimum flame conditions for the P-mode flame photometric detector. For Japanese leek, onion, scallion, and garlic, recoveries of diazinon,

ronnel, malathion, sumithion, and parathion were from 74 to 106%.

75-1793. Iwaida, M.; Yamaji, A.; Kaneda, Y. (Natl. Inst. Hyg. Sci., Osaka Branch, Osaka, Japan). [**Analytical studies on pesticides by gas chromatograph with flame photometric detector. IV. Analytical method of captan, difolatan, and morestan residues.**] *Yakugaku Zasshi (J. Pharm. Soc. Jpn.)* 94(10): 1334-1337; 1974. (7 references) (Japanese)

Residues of captan, difolatan, and morestan were investigated using a gas chromatograph with a flame photometric detector. Good separation of these and organophosphorus pesticides was obtained on a 5% DC-200 column. The relative response ratios to parathion were measured and found useful for identification of these agricultural pesticides. Residues were extracted with benzene, the extract concentrated, cleaned up by florisil column chromatography, and analyzed using the S mode of the flame photometric detector. Recoveries of the pesticides from fortified vegetables and fruits were from 81% to 115%.

75-1794. Thielemann, H. (Lehrstuhl Allg. und Kommunalhyg., Martin-Luther Univ. Halle-Wittenberg, Halle/Saale, DDR). **Duennschichtchromatographische Trennung und Identifizierung einiger herbizidwirksamer Pflanzenschutzmittel.** [**Separation and identification of herbicidal plant protecting agents by thin-layer chromatography.**] *Z. Chem.* 13(5): 226-227; 1973. (2 references) (German)

An improved method for the separation and identification of 2,4-DP, MCPB, CMPP, MCPA, 2,4-D by thin-layer chromatography method is described. Cyclohexane/acetic acid in a ratio of 90:10, cyclohexane/acetic acid in a ratio of 95:5, and benzene/acetic acid/cyclohexane in a ratio of 10:10:80 are used as solvent systems for the separation. Mixed layers of silica gel G and kieselguhr G in a ratio of 2:3 are used following activation at 110°C for 1 hr. Following spraying with bromocresol green, light yellow spots appear against a blue background.

75-1795. Thielemann, H. (Hyg.-Inst., Martin-Luther-Univ. Halle-Wittenberg, Halle/Saale, DDR). **Duennschichtchromatographische Trennung und Nachweisgrenzen (semiquantitative Bestimmung) einiger chlorierter Kohlenwasserstoffe (Insektizide) an Fertigfolien.** [**Thin-layer chromatographic separation and detection limits (semiquantitative determination) of chlorinated hydrocarbons (insecticides) on ready-made foils.**] *Z. Chem.* 14(7): 292; 1974. (German)

The thin-layer chromatographic separation and semiquantitative determination of organochlorine pesticides, such as DDT, DDE, lindane, dieldrine, endrin, aldrin, and methoxychlor were studied. Hexane, *n*-heptane/ether in a 90:10 ratio, *n*-heptane/acetone in a 90:10 ratio, carbon tetrachloride, cyclohexane, and cyclohexane/chloroform in a 95:5 ratio were used as solvent systems. Ready-made foil type UV 254 by Sklarny Kavalier, Czechoslovakia, was used for the determination. Following drying in air, the foil is sprayed with silver nitrate solution, and subsequently exposed to UV light for 10 to 15 min. Lindane requires an exposure time of 30 min. The limit of detection was determined to be 0.05 μg for DDT, 0.1 μg for DDE, 0.4 μg for lindane, 0.05 μg for methoxychlor, and 0.3 μg for aldrin, dieldrin, and endrin. Semiquantitative determination was possible at a minimum concentration of 0.3 μg for DDT, DDE and methoxychlor, 1 μg for lindane, 0.7 μg for aldrin, and 0.5 μg for dieldrin and endrin.

75-1796. Thielemann, H. (Lehrst. Allg. und Kommunalhyg., Martin-Luther-Univ. Halle-Wittenberg, Halle/Saale, DDR). **Zur semiquantitativen duennschichtchromatographischen Bestimmung von Parathion-methyl nach Verseifung und Reduktion zu p-Aminophenol.** [**Semiquantitative TLC determination of methyl parathion following hydrolysis and reduction to *p*-aminophenol.**] *Z. Chem.* 14(10): 407-408; 1974. (7 references) (German)

A thin-layer chromatographic method for the semiquantitative determination of methyl parathion is described. The sample containing methyl parathion is applied to a chromatographic layer, after which methyl parathion is subjected to alkaline hydrolysis subsequently reduced to *p*-aminophenol by spraying with 15% tin(II) chloride solution containing hydrochloric acid. A 70:30 ratio of benzene and acetone is used as a solvent system. The chromatographic layer is dried at 100°C, after which the spots are visualized by means of spray reagents, such as diazotized sulfanilic acid in hydrochloric acid, combined with sodium nitrite solution and sodium carbonate, or Ehrlich's reagent. The lower limit for semiquantitative determination ranges from 0.4 to 4 μg depending on the kind of the visualizing agent applied.

75-1797. Supin, G. L.; Budnikov, G. K. (All-Union Sci. Res. Inst. Chem. Protect. Plants, Moscow, U.S.S.R.). **Ispol'zovanie nakopleniya dlya povysheniya chvstvitel'nosti opredeleniya organicheskikh beshchestv metodom bol'tampernoi octsillograficheskoi polyarografii.** [**Use of accumulation for increasing the sensitivity of determination of organic substances by the method of voltammetric oscillographic polarography.**] *Zh. Anal. Khim.* 28(8): 1459-1464; 1973. (24 references) (Russian)

Polarographically active organic substances can be determined by voltammetric oscillographic polarography on a slowly dropping mercury electrode (T= 7—12 sec). Sensitivity is high under optimal conditions of accumulating organic substances (using adsorption or formation of insoluble mercury salts). This method has been successfully used for determination of microamounts of biologically active compounds, e.g., mucoperchloric acid, γ-isomer of hexachlorocyclohexane (lindane), insecticidal derivatives of dithiophosphoric acids, and fungicidal salts of dithiocarbamic acids.

75-1798. Mamedov, Sh.; Osipov, O. B.; Nizker, P. L.; Ramazanov, A. A. (Inst. Petrochemical Processes, Yu. G. Mamedaliyev Acad. Sci., Azerbaidzhan SSR, USSR). **Gazokhromatograficheskiy analiz nekotorykh serasoderzhashchikh efirov.** [**Gas-chromatographic analysis of some sulfur-containing ethers.**] *Zh. Prikl. Khim. (Leningrad)* 46(8): 1878-1880; 1973. (6 references) (Russian)

A method for the gas-chromatographic separation and determination of thiocarbinol and thioether pesticide homolog series, including alkoxymethyl ethers of alkylmercaptoethanol - 2 and 1 - alkylmercapto - 3 - methoxypropanol - 2, is described. A flame-ionization detector, a column packed with hexamethyldisilaxane-modified chromosorb W with 10% apiezon L, and helium as carrier gas were used for the determination. The separation of the homolog series was best at a column temperature of 180°C.

The Administrator of the U.S. Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical approved by the Director of the Office of Management and Budget February 6, 1973.

Pesticides Abstracts is available on 16 mm microfilm. Additional information can be obtained from the Technical Services Division.

ORDER FORM FOR
PESTICIDES ABSTRACTS

To: Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

Please enter my subscription for Pesticides Abstracts. I am enclosing Money Order ☐ Check ☐ for this subscription.
(**$18.25 a year; $4.60 additional for foreign mailing.**)

Please address as follows: _____

_____

_____

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 1968

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Subscription price, domestic, $18.25 a year, $4.60 additional for foreign mailing. Price for a single copy of this issue is $1.40, Index issue $2.35.

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
TECHNICAL SERVICES DIVISION
RM. EB-49, 401 M STREET, S.W.
WASHINGTON, D.C. 20460

POSTAGE AND FEES PAID
FOURTH CLASS RATE BOOK
EPA-335

Serials Department
Xerox University Microfilms
300 North Zeeb Road
Ann Arbor, MI 48106 EPA 18-1

If you do not desire to continue receiving this publication, please CHECK HERE ☐; cut off this label and return it to the above address. Your name will then be removed from the mailing list.